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A MONOGRAPH

OF

THE GENUS DRYOPTERIS

PART II

THE TROPICAL AMERICAN BIPINNATE-DECOMPOUND SPECIES

BY

CARL CHRISTENSEN

D. KGL. DANSKE VIDENSK. SELSK. SKRIFTER, NATURV. OG MATHEMATISK AFD. 8. RÆKKE, VI, 1.

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KØBENHAVN
HOVEDKOMMISSIONÆR: ANDR. FRED. HØST & SØN, KGL. HOF-BOGHANDEL
BIANCO LUNOS BOGTRYKKERI
1920

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Introduction.

With this second part of the monograph of the genus *Dryopteris*, of which the first part was published in 1913 (Vid. Selsk. Skr. 7. Række, **10**: 53—282), the treatment of the known species from tropical America is brought to an end. In this part those species are dealt with which have a bipinnate or multipartite lamina, together with some additions to the first part. Because of the genus being one of the largest existing in the plant-world, and because of the extraordinary comprehensive material, which has accumulated in the herbaria, (probably larger than existing in any genus of Phanerogams including a similar number of species, because all travellers collect ferns, many of them *only* ferns), and which was placed at my disposal for study from several of the leading herbaria, it became impossible to obtain at one time all the American species of the genus. As my studies, however, during several years have led me to classify the species in an entirely new manner, it became very difficult for me to secure for study from the herbaria all the species belonging to a single group, as I was unaware of which group several species unknown to me ought to be referred to according to my classification. I, therefore, chose to divide the species into two parts after the degree of division of their lamina, a character easily recognized by every botanist, and in this manner I succeeded in procuring about all the specimens I was to use. I chose to draw the limit between the species having bipinnatifid lamina and those being bipinnate; this division is, of course, purely artificial, but in reality less unnatural than may be imagined.

The material, which forms the base of this second part, was borrowed principally from the same herbaria which are mentioned in the first part, to which must be referred regarding abbreviations. The herbarium of Dr. H. Christ is now incorporated in Herb. Roland Bonaparte, which also now contains the herbarium of Sodiro; from that collection I have had some type-specimens of species which ought to have been dealt with in the first part, but which at that time were unknown to me. From Prof. Dr. Kümmerle, Budapest, I have received a series of fragments of specimens collected by Sodiro and others.

I am extremely obliged to all those, who so kindly placed their material at my disposal and hereby bring them my sincerest thanks.

The tropics and subtropics of the Old World are presumably inhabited by a similar number of species of *Dryopteris* as is America, and probably several more are to be found there. It was always my intention to pursue my studies

of the genus by a critical revision of the species of the Old-World, as soon as I had finished my work upon the American species. It will, probably, be very difficult to get together a similar material including type-specimens of all or at least of most described species, because many of these are preserved in herbaria in Africa, Asia and Australia, and without type-specimens an unraveling of the numerous forms is quite hopeless. Should I, however, succeed in getting a sufficient material of most species, I shall be very glad to continue this monograph.

As I have tried to prove in my earlier papers on *Dryopteris*, that large genus of ferns may be divided into a number of well defined subgenera, and in the first part of the present monograph I have referred the tropical American species having a pinnatifid-bipinnatifid lamina to ten subgenera. Since that part was published I have examined about 3000 specimens of species which have more divided leaves, and these later studies have affirmed that my classification is a natural one. I have no doubt that those species, which are grouped together within the same subgenus, belong together genetically, while, on the other hand, they are very remotely related to species belonging to other subgenera. I am convinced that most, if not all, of the defined subgenera really are good genera such as genera are commonly understood. It is, in reality, quite unnatural to unite into a single genus such different plants as those belonging to *Eudryopteris* and *Ctenitis* and those belonging to *Goniopteris* and *Meniscium*, and even the species of *Eudryopteris* and *Ctenitis*, or of *Lastrea* and *Cyclosorus*, which very often closely resemble each other in habit, are no doubt generically different. Although I firmly believe now, as before, that it would be the most natural treatment to divide the large genus into several natural genera, I find it practical so retain my groups as subgenera under *Dryopteris*. When the species of the Old World have been critically examined the proper time will have arrived to split up the "genus" *Dryopteris* into genera. In this work I, therefore, follow my earlier classification with some minor changes. The order of the subgenera I have altered, and I have referred *Glaphyropteris* to *Lastrea* as a special group, this large subgenus thus becoming more sharply delimitated and separated from the other genera. Within the subgenus *Ctenitis* I have changed the order of numbers of the species so as to bring those species which are naturally related close to each other, and finally, I have in this work defined two more subgenera, so that all American species are now referred to eleven subgenera. In a special list I have enumerated all species known to me in the order which I think must be considered the most natural one. The number of the species in the descriptive part is the same as in the list referred to.

My studies of the more divided species of the genus have shown, however, that not all of these species can be naturally united with the subgenera

previously defined. It was necessary, therefore, to create two new subgenera, *Parapolystichum* and *Polystichopsis*, which are both well characterized and in several features very different from the other subgenera. I shall here briefly mention a single one of the characters, by which they are distinguished from other decomposite species, viz. the architecture of the leaf as it appears from the arrangement of the divisions of the 2nd, 3rd and 4th order. METTENIUS has clearly seen the importance of that character, and in the introduction to his monograph on *Aspidium* und *Phegopteris* he has given a detailed description of the different kinds, in which the ribs and veins are arranged in the two genera adopted by him. His division into *Polystichoideæ*, *Phegopteroideæ*, and *Cyatheoideæ*, is based upon that character. The classification of METTENIUS has, however, only slightly influenced later pteridologists in their grouping of the species and only few (f. inst. KEYSERLING and HILLEBRAND) have used METTENIUS' character. The neglect of a character, which was pointed out by a pteridologist of considerable perspicacity, is probably due to the circumstance that other characters (presence or abscence of indusium, venation and others) have been considered the most important as characters of groups, compelling the authors to group together species that as to architecture are utterly different; also it is probable that the character has been underestimated, because it is scarcely available when bipinnatifid species are concerned. I have found, however, that METTENIUS in this case, as in several others, understood more clearly than several later pteridologists how to estimate, which characters are to be considered the most important ones. Having worked during a long time, as I have, with a very large material of composite species, one is struck by the fact that the architecture of the lamina is the very character of the utmost importance for the right understanding of how the species may naturally be grouped together. It was rather difficult to METTENIUS to bring all species under his three groups, and he was compelled to create subdivisions connecting them. He wanted to prove that the arrangement of the ribs of all divisions of a leaf is ruled by immutable laws, which it certainly is not; still his main-divisions are right. With special regard to the American species the most important difference in the architecture of the decomposite leaves may be characterized as follows,

It must always be remembered that a stable arrangement of the ribs can be found in leaves only that are divided to a certain degree, at least twice. The sequence of the primary pinnæ is unavailable, and the most often lengthened pinnulæ of the basal pinnæ are equally to be excepted. Of special importance is the arrangement of the secondary pinnules on the medial primary pinnæ, not only because it is constant within the same species, but also because it is always the same in all species which by other characters appear to be closely related. This arrangement is of two different types:

1. The first secondary pinnula of a medial primary pinna is the basiscopic, i. e. that directed toward the base of the leaf; the arrangement is catadromous, the lamina cyatheoid (fig. 1).

2. The first secondary pinnula is the acroscopic, i. e. that directed toward the apex of the leaf; the arrangement is anadromous, the lamina polystichoid (fig. 2.)

This difference in the sequence of the secondary pinnules, which, as a rule, is repeated in the later divisions of the leaf, may appear to be rather unimportant, but it stands in correlation to the different development of the acroscopic and basisco-

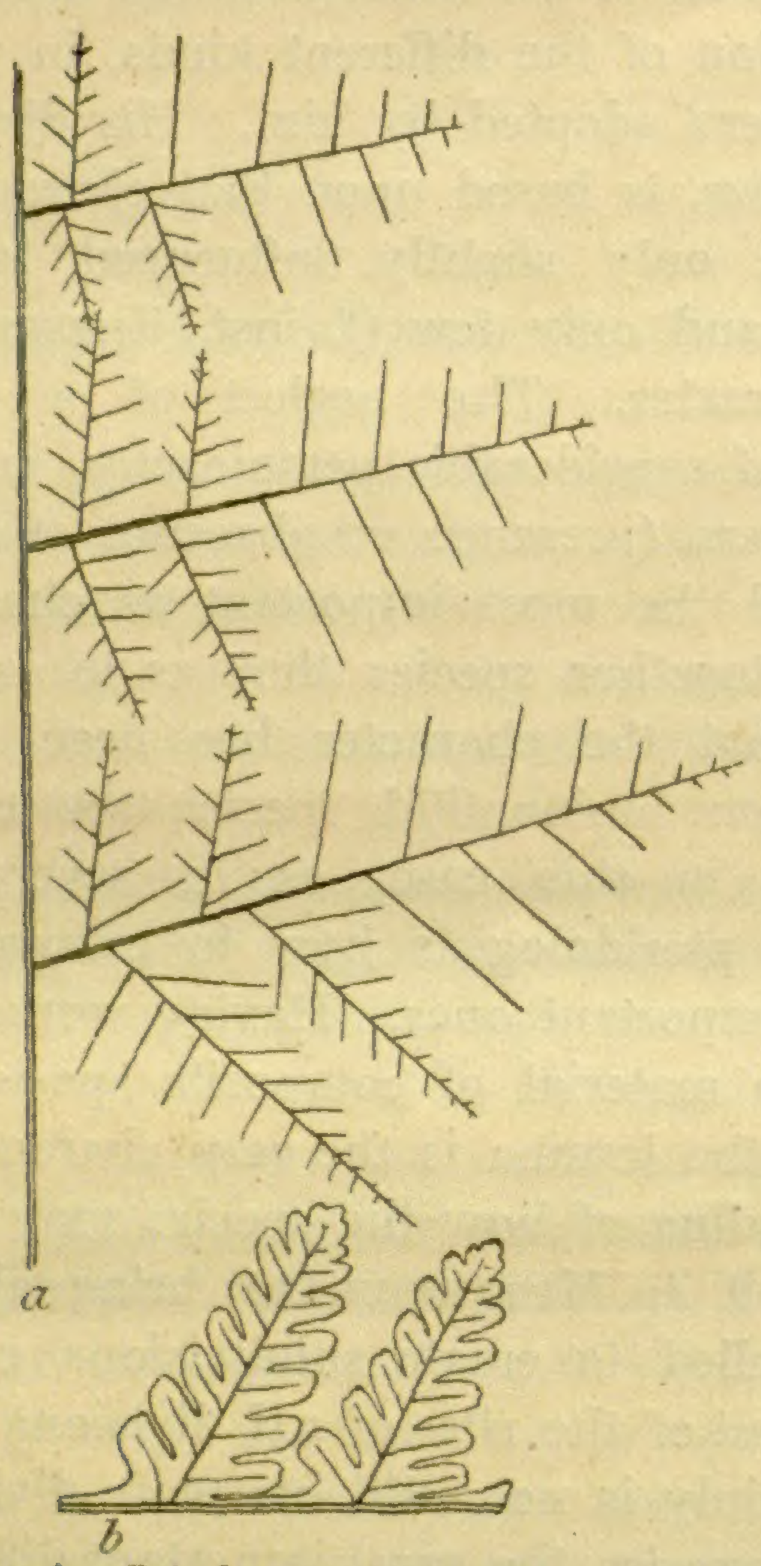

Fig. 1. Catadromous structure.

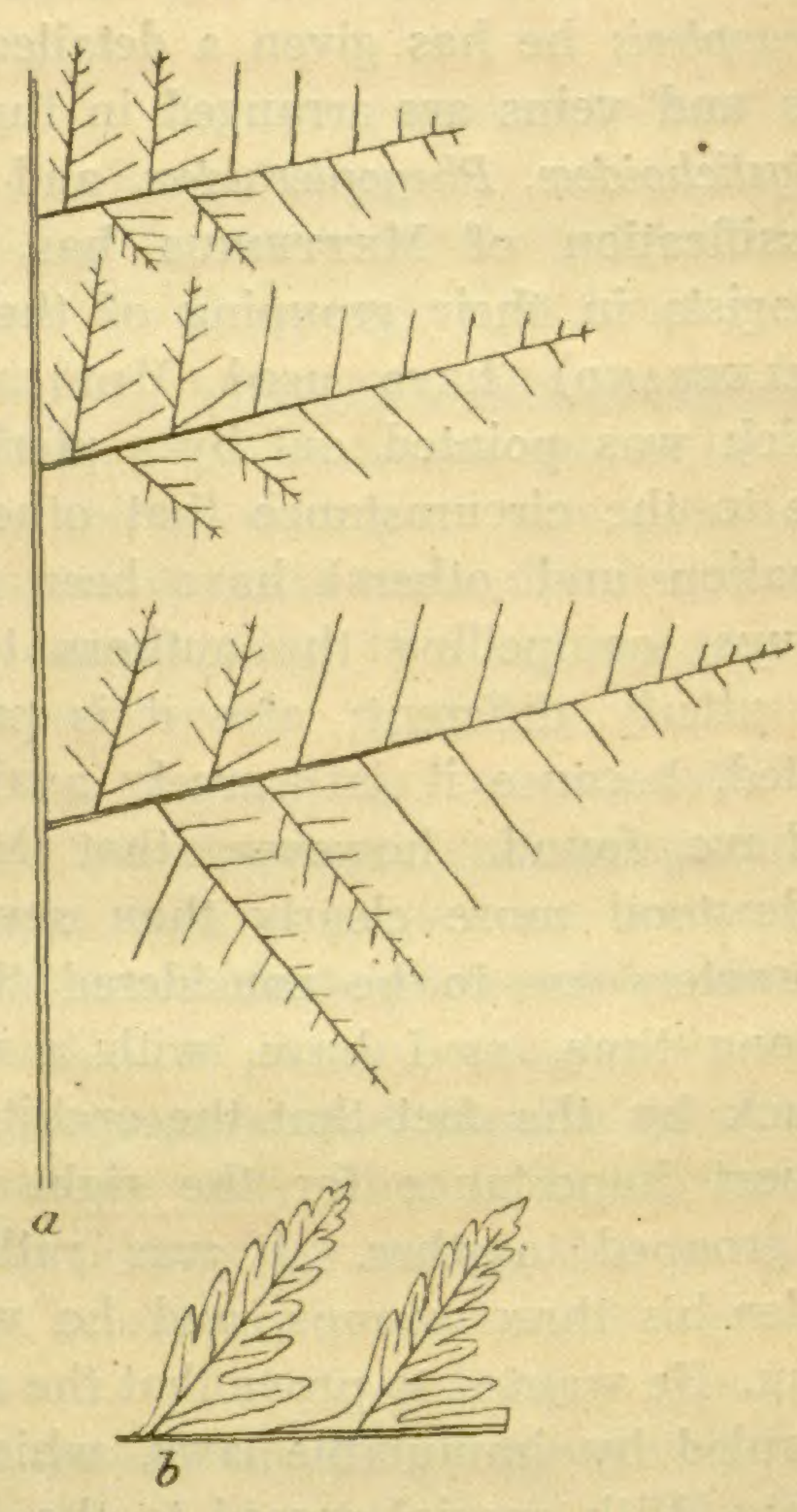

Fig. 2. Anadromous structure.

pic pinnules; the most developed pinnules claim the largest room. In the basal pinnæ there is downward room enough for the extremest development of the secondary basiscopic pinnules, and a wider space is obtained for the first basiscopic pinnula, when it removes as number two on the midrib of the pinna, by which position the interior tertiary pinnules also get room for a greater development. In all more divided species the arrangement of the secondary pinnules of the basal pinnæ is anadromous. In the middle of the leaf, where there is less room, it is otherwise. In a series of species the two basal secondary pinnulæ are about equally developed and about of the same size as the following ones, their midribs run out from the midrib of the pinna from nearly the same point, the pinnules being opposite, but more commonly the basiscopic is the first, a little closer to the rachis

than the acroscopic one; the basiscopic secondary pinnules thus are nos. 1, 3, 5 etc., the acroscopic ones nos. 2, 4, 6 etc. This catadromous arrangement is the rule in species of *Eudryopteris* and *Ctenitis*.

In other species of a polystichoid habit, i. e. the acroscopic basal pinnules of the 2nd, 3rd or 4th order are much more developed than the basiscopic ones, which gives the partitions of any order a characteristic shape, cuneate at the back, auriculate in front, the acroscopic pinnule is always the first, while the basiscopic one is moved far up from the rachis and, as a rule, much smaller, so that space is gained for the large acroscopic pinnula below. This anadromous arrangement (fig. 2) is characteristic of all species of *Polystichopsis*.

This characteristic difference between anadromous and catadromous decomposite leaves can also be observed in the arrangement of the basal veins of segments of the ultimate order, where these toward the apex of the pinnula of the previous order become sessile or confluent. We have here two types:

1. The first basal vein of the ultimate order is the basiscopic; it runs out from the very base of the midrib of the ultimate segment, or, frequently, from the midrib of the pinnula of the former order. So in *Ctenitis* (fig. 1 b).
2. The first basal vein is the acroscopic one, it runs out from the midrib of the ultimate segment a little above its base, the basiscopic basal vein is no. 2 and is very oblique. So in *Polystichopsis* (fig. 2 b).

Between these two principal types an intermediate type is to be found in the subgenus *Parapolystichum*, and METTENIUS named the species belonging here *Subpolystichoideæ*. The arrangement of the ribs of these species is as a whole catadromous, but the veins of the ultimate order show considerable inconstancy in this character in the same leaf, as the basiscopic as well at the acroscopic basal vein may be the first; frequently they are opposite, still the ultimate pinnulæ are, as a rule, decidedly polystichoid with the acroscopic basal segment considerably enlarged, while the basiscopic one is small and oblique, exactly as in the species of *Polystichopsis*.

The number of species adopted in the two parts of this monograph is 347. In North America 17 more species are to be found, thus the whole number of known American species af *Dryopteris* is 364. No doubt several others may exist; I have had for examination several defect specimina, which certainly belong to undescribed species, and some few species described recently by other authors I have not seen. Some of these will probably prove to be identical with species described in this work. Some few of the species adopted by me may possibly be found to be too weakly characterized, when more material is collected, and must be reduced to be

forms of other species, but, on the other hand, some of my species are veritable collective species, including two or several really valid species. It was to me, however, of more importance to describe as exactly as possible all the older species than to create a series of new species. The chaos ruling in most collections of this mighty genus shows best, how many of the old species have been falsely interpreted. My descriptions are, as a rule, drawn up after the type-specimen and completed from other specimens which in details agree with it. Several species dealt with in this part have very large leaves, and generally only a part of a leaf is to be found in the herbaria; especially old specimens are very fragmentary. Only a comparison of a series of specimens, which agree in minute characters, can show, how the shape and size of the leaf are. To which "biological type" (RAUNKIÆR) most of the the species belong it is impossible to decide, because very rarely the stem (rhizome or caudex) is found in the herbaria and rarely the labels give any information of their characters, the description of which ought to be an essential part of any diagnosis of a plant. Field-studies in the tropics with special regard to the biological types of the ferns are much needed.

Not a few of the most characteristic species from the South-American Andes have been collected once only, others have been rediscovered at localities far from the type-locality; these facts have convinced me that the valleys of the Andes are inhabited by several unknown species, how many I cannot say, of course, but I believe that more than 500 species of the genus *Dryopteris*, as here understood, are growing in America. The geographical distribution of these species is interesting, and I believe that several important results for the geography of plants could be gained by a comparative study of the distribution of the species of a genus so rich in species as *Dryopteris*. The results obtained by my studies may possibly form the subject of another paper.

The Most Important Characters of the Subgenera.

(The American species only considered.)

A. Lamina entire to bipinnate, very rarely tripinnate or decompound *(D. Linnaeana, Robertiana, setigera)*, most often bipinnatifid, more or less hairy but sparsely scaly. Hairs of different type, most often unicellular, simple or branched, never articulated; scales entire or subentire, often ciliated by simple or branched hairs or pubescent throughout. Veins free, connivent or goniopteroid.

I. **Lastrea** (incl. *Phegopteris* proper and *Glaphyropteris).* Veins free, the basal ones run out to the margin above sinus, rarely furcate. Lamina bipinnatifid-bipinnate, very rarely more divided (*D. Linnaeana* etc.), often much reduced toward the base. Hairs nearly always simple. Indusium present, most often small, or none. Aërophores frequent at the base of the pinnæ; in the section *Glaphyropteris* aërophores are found also at the base of the pinnules. Sessile glands common. Species 1—140.

II. **Steiropteris.** As *Lastrea*, but the basal veins run to the sinus, below which is a cartilagineous membrane, that in dried specimens becomes folded and forms a keel running from the sinus toward the costa. Aërophores at the bases of pinnæ frequent; sessile glands none. Rhizome creeping. Species 141—153.

III. **Cyclosorus.** Lower 1—4 pairs of veins run to sinus or to a membrane, which scarcely forms a keel but is often protruded beyond the sinus as an apophysis, or the basal pair of veins are united in the leaf-tissue and send an excurrent vein to the sinus. Aërophores none; under-surface often glandular. Lamina often softly pubescent by single hairs as are the generally persistent, reniform indusia. Sori globose, sporangia glabrous. Species 154—166.

IV. **Leptogramma.** As *Cyclosorus*, but sori oblong or linear, exindusiate; sporangia setose. Species 167—169.

V. **Goniopteris.** Veins free, the basal ones connivent to sinus, or anastomosing, goniopteroid or meniscioid. Lamina often proliferous, most often dark-green. Scales few, always with few or many branched hairs; branched, short-stalked hairs are found also on the rachis and, in some species, also on ribs and leaf-tissue. Sori round, indusiate or not; sporangia setose or not. Species 170—232.

VI. **Meniscium.** Sori confluent, exindusiate. All veins meniscioid. Branched hairs none. Species 233—245.

B. Lamina pinnate-bipinnate or decompound and then broadly ovate or deltoid in outline, entirely without true hairs (*Eudryopteris* and *Stigmatopteris)* or pubescent; all pinnate-bipinnatifid species with pubescence have at least the costæ above rusty-tomentose with articulated hairs. Veins free, at least never goniopteroid.

VII. **Eudryopteris.** True hairs absent, but rhizome, stipe and rachises more or less clothed with scales, which are entire or fimbriate, never ciliated by hairs. Costulæ II-III or IV (corresponding to the degree of division) are decurrent. Sori with large, reniform, generally persistent indusia. Most species bipinnate-decompound, generally deltoid in outline, catadromous in all divisions. Veins generally forked. Species 246—263.

VIII. **Stigmatopteris.** True hairs absent, but rhizome and rachises often scaly with thin fimbriate, not ciliate scales. Lamina pinnate-bipinnatifid, rarely tripinnatifid, as a rule distinctly pellucido-punctate with immersed glands. Costulæ not decurrent, veins not reaching the margins, clavate, sometimes irregularly anastomosing. Sori exindusiate or (in the section *Peltochlaena)* covered by deciduous, large, peltate indusia. Apex of pinnæ sharply serrate to the very point. Species 264—283.

IX. **Ctenitis.** Lamina bipinnatifid-decompound. Costæ and costulæ above rusty-tomentose with short articulated hairs or antrorsely strigose or patently hairy with pluricellular hairs (so only in decompound species). Rhizome and rachises generally densely scaly, the scales most often clathrate and toothed or fimbriate, never ciliated. Decompound leaves catadromous throughout, never gemmiferous. Species: 284—349.

X. **Parapolystichum.** Lamina decompound, catadromous in the first divisions, subanadromous in the ultimate pinnules, these being cuneate at the posterior base, the basal anterior segment or pinnula enlarged; rachis often gemmiferous. The deeply channelled costæ and costulæ above with articulated hairs or glabrous. Species 350—352.

XI. **Polystichopsis.** Lamina decompound, anadromous in all divisions, in most species coriaceous. Species 353—364.

Systematical Enumeration of All Known American Species of Dryopteris.

This list includes in systematical order all American species of the genus, not only those dealt with by me in the two parts of the present monograph, but also those that are found in North America only. These North American species — the numerous described hybrids are not included — are marked in the list by an asterisk. The figures in parenthesis after the name refer to the number of the species in the first part; species dealt with in the present part are printed in *italics*. The numbers of the species in the descriptive part of this work correspond to those of the list below.

I. Lastrea (Bory).

A. *Lastrea* proper.

1. pusilla (Mett.) O. Ktze. (54)
2. brachypoda (Bak.) C. Chr. (55)
3. *sancta* (L.) O. Ktze. (56)
4. sanctiformis C. Chr. (57)
5. longicaulis (Bak.) C. Chr. (58)
6. *consanguinea* (Fée) C. Chr. (59)
7. delicatula (Fée) C. Chr. (60)
8. pseudosancta C. Chr. (61)
9. physematioides (Kuhn et Christ). (62)
10. opposita (Vahl) Urban. (63)
11. *rupicola* C. Chr.
12. riopardensis Ros. (64)
13. coarctata (Kze.) C. Chr. (65)
14. *leucothrix* C. Chr. (66)
15. *Rosei* Maxon
16. *panamensis* (Pr.) C. Chr. (67)
17. silviensis Hieron. (68)
18. *scalpturoides* (Fée) C. Chr. (69)
19. *Shaferi* Maxon et C. Chr.
20. *concinna* (Willd.) O. Ktze. (70)
21. *subandina* C. Chr. et Ros.
22. rufa (Poir.) C. Chr. (71)
23. Stierii (Ros.) C. Chr. (72)
24. blanda (Fée) C. Chr. (73)
25. tablana (Christ) C. Chr. (74)
26. Rimbachii Ros. (75)
27. brachypus (Sod.) C. Chr. (76)
28. supranitens Christ (77)
29. tablaziensis Christ (78)
30. *Jimenezii* Maxon et C. Chr.
31. Lindigii C. Chr. (79)
32. lustrata (Hieron.) C. Chr. (80)
33. *hydrophila* (Fée) C. Chr. (81)
34. Lorentzii (Hieron.) C. Chr. (82)
35. argentina (Hieron.) C. Chr. (83)
36. oligocarpa (H. B. W.) O. Ktze. (84)
37. *oregana C. Chr.
38. *retusa* (Sw.) C. Chr.
39. *ptarmiciformis* C. Chr. et Ros.
40. pilosula (Kl. et Karst.) Hieron. (85)
41. rivulariformis Ros. (86)
42. Regnelliana C. Chr. (87)
43. rioverdensis C. Chr. (88)
44. Nockiana (Jenm.) C. Chr. (89)
45. muzensis Hieron. (90)

46. columbiana C. Chr. (91)
47. piedrensis C. Chr. (92)
48. boqueronensis Hieron. (93)
49. lepidula Hieron. (94)
50. Lindmani C. Chr. (95)
51. laevigata (Mett.) C. Chr. (96)
52. Crossii (Bak.) C. Chr. 97)
53. Galanderi (Hieron.) C. Chr. (98)
54. Millei C. Chr. (99)
55. phacelothrix (100)
56. caucaensis (Hieron.) C. Chr. (101)
57. Funckii (Mett.) O. Ktze. (102)
58. velata (Kze.) O. Ktze. (103)
59. aspidioides (Willd.) C. Chr. (104)
60. ptarmica (Kze.) O. Ktze. (105)
61. *oreopteris (Sw.) Maxon
62. *pachyrachis* (Kze.) O. Ktze. (106)
63. supina (Sod.) C. Chr. (107)
64. tenerrima (Fée) Ros. (108)
65. palustris (Mett.) O. Ktze. (109)
66. Hieronymusii C. Chr. (110)
67. roraimensis (Bak.) C. Chr. (111)
68. utañagensis Hieron. (112)
69. illicita Christ (113)
70. atropurpurea Hieron. (114)
71. *arborea* Brause
72. recumbens Ros. (115)
73. rustica (Fée) C. Chr. (116)
74. Germaniana (Fée) C. Chr. (117)
75. melanochlaena C. Chr. (118)
76. atrorubens (Mett.) C. Chr. (119)
77. demerarana (Bak.) C. Chr. (120)
78. dominicensis C. Chr. (121)
79. Moritziana Urban (122)
80. nitens (Desv.) C. Chr. (123)
81. *diplazioides* (Desv.) Urban (124)
82. consimilis (Fée) C. Chr. (125)
83. heteroclita (Desv.) C. Chr. (126)
84. atrovirens C. Chr. (127)
85. leptogrammoides Ros. (128)
86. firma (Bak.) C. Chr. (129)
87. Pavoniana (Kl.) C. Chr. (130)
88. Rosenstockii C. Chr. (131)
89. Santae Catharinae Ros. (132)
90. Jürgensii (Ros.) C. Chr. (133)
91. Mosenii C. Chr. (134)
92. *rivularioides* (Fée) C. Chr. (135)
93. scariosa Ros. (136)
94. *noveboracensis (L.) A. Gray
95. *simulata Dav.
96. *thelypteris (L.) A. Gray
97. tremula Christ (137)
98. *phegopteris (L.) C. Chr.
99. *hexagonoptera (Michx.) C. Chr.
100. siambonensis (Hieron.) C. Chr. (138)
101. achalensis (Hieron.) C. Chr. (139)
102. Sprengelii (Kl.) O. Ktze. (140)
103. struthiopteroides C. Chr. (141)
104. Mercurii (A. Br.) Hieron. (142)
105. conformis (Sod.) C. Chr. (143)
106. scalaris (Christ) C. Chr. (144)
107. Bonapartii Ros. (145)
108. Bradei Christ. (146)
109. Rusbyi C. Chr. (147)
110. Christensenii Christ (148)
111. limbata (Sw.) O. Ktze. (149)
112. corazonensis (Sod.) C. Chr. (150)
113. semilunata (Sod.) C. Chr. (151)
114. canelensis Ros. (152)
115. nervosa (Kl.) C. Chr. (153)
116. *rudis* (Kze.) C. Chr. (154)
117. Engelii Hieron. (155)
118. peruviana Ros. (156)
119. Heineri C. Chr. (157)
120. strigifera Hieron. (158)
121. Brausei Hieron. (159)
122. piloso-hispida (Hook.) C. Chr. (166)
123. euchlora (Sod.) C. Chr. (161)
124. Glaziovii Christ (162)
125. *pteroidea* (Kl.) C. Chr. (163)
126. cochaensis C. Chr. (164)
127. Ruiziana (Kl.) C. Chr. (165)
128. lanipes C. Chr. (166)
129. horrens Hieron. (167)
130. mertensioides C. Chr. (168)
131. cheilanthoides (Kze.) C. Chr. (169)
132. multiformis C. Chr. (170)

B. *Glaphyropteris*

133. Cañadasii (Sod.) C. Chr. (171)
134. macradenia (Sod.) C. Chr. (172)
135. Thomsonii (Jenm.) C. Chr. (173)
136. mapiriensis Ros. (174)
137. decussata (L.) Urban (175)
138. polyphlebia C. Chr. (176)

C. Group of *D. Linnaeana*

139. *Linnaeana C. Chr.
140. *Robertiana (Hoffm.) C. Chr.

Introduced species:

setigera (Bl.) O. Ktze

II. Steiropteris C. Chr.

141. Wrightii (Mett.) O. Ktze. (177)
142. deltoidea (Sw.) O. Ktze. (178)
143. L'Herminieri (Kze.) C. Chr. (179)
144. lonchodes (Eat.) O. Ktze. (180)
145. densiloba C. Chr. (181)
146. incana (Christ) C. Chr. (182)
147. Leprieurii (Hook.) O. Ktze. (183)
148. praetervisa (Kuhn) O. Ktze. (184)
149. densisora C. Chr. (185)
150. valdepilosa (Bak.) C. Chr. (186)
151. insignis (Mett.) O. Ktze. (187)
152. glandulosa (Desv.) C. Chr. (188)
153. Fendleri (Eat.) O. Ktze. (189)

III. Cyclosorus (Link) C. Chr.

154. *patens* (Sw.) O. Ktze. (190)
155. Goedenii Ros. (191)
156. *normalis* C. Chr. (192)
157. augescens (Link) C. Chr. (193)
158. Berroi C. Chr. (194)
159. *serra* (Sw.) O. Ktze. (195)
160. *oligophylla* Maxon (196)
161. Tuerckheimii (Donn. Sm.) C. Chr. (197)
162. Bangii C. Chr. (198)
163. urens Ros. (199)
164. *dentata* (Forsk.) C. Chr. (200, moliis)
165. *gongylodes* (Schkuhr) O. Ktze. (201)
166. Martini C. Chr. (202)

IV. Leptogramma J. Sm.

167. pilosa (Mart. et Gal.) C. Chr. (203)
168. dasyphylla C. Chr. (204)
169. polypodioides (Raddi) C. Chr. (205)

V. Goniopteris (Pr.) C. Chr.

A. *Asterochlaena.*

170. *Cumingiana* (Kze.) O. Ktze. (206)
171. Francoana (Fourn.) C. Chr. (207)
172. Skinneri (Hook.) O. Ktze. (208)
173. Levyi (Fourn.) O. Ktze. (209)
174. scolopendrioides (L.) O. Ktze. (210)
175. *Fuertesii* Brause
176. *guadalupensis* (Wikstr.) C. Chr. (211)
177. Peripae (Sod.) C. Chr. (212)
178. dissimulans Maxon et C. Chr. (213)
179. cordata (Fée) Urban (214)
180. sagittata (Sw.) C. Chr. (215)
181. reptans (Gmel.) C. Chr. (216)
182. *asterothrix* (Fée) C. Chr. (217)
183. *sclerophylla* (Kze.) C. Chr. (28)
184. *asplenioides* (Sw.) O. Ktze. (219)
185. bermudiana (Bak.) Gilb. (220)
186. semihastata (Kze.) O. Ktze. (221)
187. Jamesoni (Hook.) C. Chr. (222)
188. Warmingii C. Chr. (223)
189. macrotis (Hook.) O. Ktze. (224)
190. serrulata (Sw.) C. Chr. (225)
191. anoptera (Kze.) C. Chr. (226)
192. hastata (Fée) Urb. (227)
193. pyramidata (Fée) Maxon (228)
194. magdalenica Hieron. (229)
195. paucijuga (Kl.) C. Chr. (230)
196. refracta (Fisch. et Mey.) O. Ktze. (231)
197. gemmulifera Hieron. (232)
198. usitata (Jenm.) C. Chr. (233)
199. venusta (Hew.) O. Ktze. (234)
200. riograndensis (Lindm.) C. Chr. (235)
201. scabra (Pr.) C. Chr. (236)
202. monosora (Pr.) C. Chr. (237)
203. Eggersii (Hieron.) C. Chr. (238)
204. biformata Ros. (239)
205. equitans (Christ) C. Chr. 240
206. curta Christ (241)
207. heterotricha C. Chr. (242)
208. lugubriformis Ros. (243)
209. Schwackeana Christ (244)
210. lugubris (Kze.) C. Chr. (425)
211. glochidiata (Mett.) C. Chr. (246)
212. ancyriothrix Ros. (247)
213. *nephrodioides* (Kl.) Hieron. (248)

B. *Eugoniopteris*

214. tristis (Kze.) O. Ktze. (249)
215. nicaraguensis (Fourn.) C. Chr. (250)
216. paucipinnata (Donn. Sm.) Maxon (251)
217. Fraseri (Mett.) O. Ktze. (252)
218. cuneata C. Chr. (253)
219. Schaffneri (Fée) C. Chr. (254)
220. vivipara (Raddi) C. Chr. (255)
221. *straminea* (Bak.) C. Chr. (256)
222. Goeldii C. Chr. (257)
223. juruensis C. Chr. (258)
224. obliterata (Sw.) C. Chr. (259)

225. **nigrescentia (Jenm.) C. Chr.** (260)
226. **Rolandii C. Chr.** (261)
227. *tetragona* (Sw.) Urb. (262)
228. *megalodus* (Schkuhr) Urb. (263)
229. **leucophlebia** (Christ) C. Chr. (264)
230. *Poiteana* (Bory) Urban (265)
231. **meniscioides** (Liebm.) C. Chr. (266)
232. **Ghiesbreghtii (Linden) C. Chr. (267)**

VI. **Meniscium** (Schreber)

233. **angustifolia** (Willd.) Urban (279)
234. **reticulata** (L.) Urban (274)
235. **sorbifolia** (Jacq.) Hieron. (275)
236. **falcata** (Liebm.) C. Chr. (271)
237. *membranacea* (Mett.) C. Chr. (277)
238. **longifolia** (Fée) Hieron. (278)
239. **serrata** (Cav.) C. Chr. (280)
240. *macrophylla* (Kze.) C. Chr. (276)
241. **lingulata C. Chr.** (272)
242. **ensiformis** C. Chr. (268)
243. **Andreana** (Sod.) C. Chr. (269)
244. **pachysora Hieron. (270)**
245. **gigantea (Mett.) C. Chr. (273)**

VII. **Eudryopteris** C. Chr.

246. **Saffordii** C. Chr. (1)
247. **filix mas** (L.) Schott (2)
248. *paleacea* (Sw.) C. Chr. (3)
249. ***marginalis** (L.) A. Gray
250. ***fragrans** (L.) Schott.
251. ***floridana** (Hook.) O. Ktze.
252. ***cristata** (L.) A. Gray
253. ***Clintoniana** (Eat.) Dow.
254. ***Goldiana** (Hook.) A. Gray
255. ***(rigida*?) arguta** (Klf.)
256. ***spinulosa** (Müll.) O. Ktze
257. *mexicana* (Pr.) C. Chr. (4)
258. **glandulifera (Liebm.) C. Chr. (5)**
259. **cinnamomea** (Cav.) C. Chr. (6)
260. **indecora** (Liebm.) C. Chr. (7)
261. *patula* (Sw.) Und. (8)
262. **Maxoni Und. et C. Chr.** (10)
263. *Karwinskyana* (Mett.) O. Ktze. (11)

VIII. **Stigmatopteris** C. Chr.

A. *Eustigmatopteris.*

264. St. rotundata (Willd.) C. Chr. (12)
265. - Carrii (Bak.) C. Chr. (13)
266. - tijuccana (Raddi) C. Chr. (14)
267. St. prionites (Kze.) C. Chr. 15)
268. - nephrodioides (Kl.) C. Chr. (16)
269. - Michaëlis (Bak.) C. Chr. (17)
270. - longicaudata (Liebm.) C. Chr. (18)
271. - alloëoptera (Kze.) C. Chr. (19)
272. - opaca (Bak.) C. Chr. (20)
273. - caudata (Raddi) C. Chr. (21)
274. - ichtiosma (Sod.) C. Chr. (22)
275. - contracta (Christ) C. Chr. (23)
276. - pellucido-punctata C. Chr. (24)
277. - *Lechleri* (Mett.) C. Chr. (25, prasina)
278. - *cyclocolpa* (Christ) C. Chr.
279. - *ecuadorensis* C. Chr.

B. *Pellochlaena* (Fée).

280. **varians** (Fée) O. Ktze. (26)
281. **sancti-gabrielis** (Hook.) O. Ktze. (27)
282. **subobliquata** (Hook.) O. Ktze. (28)
283. *abbreviata* (Schrad.) O. Ktze.

IX. **Ctenitis** C. Chr.

A. Group of *D. submarginalis.*

284. **pedicellata (Christ) C. Chr. (29)**
285. **refulgens** (Kl.) C. Chr. (30)
286. **alsophilacea** (Kze.) O. Ktze. (31)
287. **falciculata** (Raddi) O. Ktze. (32)
288. **ctenitis** (Link) O. Ktze. (33)
289. **submarginalis** (L. et F.) C. Chr. (34)
290. **Karstenii** (A. Br.) C. Chr. (35)
291. **deflexa** (Klf.) C. Chr. (26)
292. **Anniesii Ros. (37)**
293. **fenestralis C. Chr. (38)**
294. **vellea (Willd.) C. Chr.** (39)
295. **cirrhosa** (Schum.) O. Ktze. (40)
296. **nigrovenia** (Christ) C. Chr. (41)
297. **Tonduzii** (Christ) C. Chr. (42)
298. *flexuosa* (Fée) O. Ktze.

B. Group of *D. hirta.*

299. **Lindeni** (Kuhn) O. Ktze. (44)
300. **Salvini** (Bak.) O. Ktze. (45)
301. **strigilosa** (Bak.) O. Ktze. (43)
302. **lanceolata** (Bak.) O. Ktze. (46)
303. **Hemsleyana** (Bak.) C. Chr. (47)
304. *chiriquiana* C. Chr.
305. *hirta* (Sw.) O. Ktze.
306. *crystallina* (Kze.) Maxon
307. *oophylla* C. Chr.
308. *nemorosa* (Willd.) Urban

309. *melanosticta* (Kze.) O. Ktze.
310. *interjecta* C. Chr.
311. *Grisebachii* (Bak.) O. Ktze.
312. *meridionalis* (Poir.) C. Chr.

C. Group of *D. ampla*.

313. *ampla* (H. B. W.) O. Ktze.
314. *excelsa* (Desv.) C. Chr.
315. *equestris* (Kze.) C. Chr.
316. *palantangana* (Hook.) C. Chr.
317. *nemophila* (Kze.) C. Chr.

D. Group of *D. subincisa*.

1. Exindusiate species.

318. honesta (Kze.) C. Chr. (48)
319. yungensis Christ et Ros. (49)
320. *biserialis* (Bak.) C. Chr. (52)
321. *macrotheca* (Fée) C. Chr.
322. leptosora C. Chr. (50)
323. platyloba (Bak.) C. Chr. (51)
324. *subincisa* (Willd.) Urban
325. *vasta* (Kze.) Hieron.
326. *spectabilis* (Kze.) C. Chr.
327. *hirsuto-setosa* Hieron. (53)
328. *atrogrisea* C. Chr.
329. *lunensis* (Christ) C. Chr.
330. *pansamalensis* C. Chr.
331. *Skottsbergii* C. Chr.
332. *squamosissima* (Sod.) C. Chr.
333. *mollicoma* C. Chr.
334. *Karsteniana* (Kl.) Hieron.
335. *grandis* (Pr.) C. Chr.
336. *connexa* (Klf.) C. Chr.
337. *umbrina* C. Chr.
338. *Blanchetiana* (Kze.) Hieron.
339. *macrosora* (Fée) C. Chr.
340. *abundans* Ros.
341. *Wacketii* Ros.
342. *adenopteris* C. Chr.
343. *hirtula* (Kze.) C. Chr.

2. Indusiate species (Group of *D. villosa*).

344. *villosa* (L.) O. Ktze
345. *andicola* C. Chr.
346. *acrosora* (Hieron.) C. Chr.
347. *villosula* C. Chr.
348. *crenulans* (Fée) C. Chr.

E. Group of *D. protensa*.

349. *protensa* (Afz.) C. Chr. var.

X. Parapolystichum Keyserl.

350. *acuta* (Kl.) O. Ktze.
351. *exculta* (Mett.) C. Chr.
352. *effusa* (Sw.) Urban.

XI. Polystichopsis (J. Sm.)

353. *pubescens* (L.) O. Ktze.
354. *chærophylloides* (Poir.) C. Chr.
355. *lurida* (Jenm.) Und. et Maxon
356. *ochropteroides* (Bak.) C. Chr.
357. *Trianae* (Mett.) O. Ktze.
358. *macrostegia* (Hook.) O. Ktze.
359. *amplissima* (Pr.) O. Ktze.
360a. *denticulata* (Sw.) O. Ktze.
360b. *laeta* (Sw.) C. Chr.
361. *rigidissima* (Hook.) C. Chr.
362. *leucostegioides* C. Chr.
363. *formosa* (Fée) Maxon.

XII. Species of uncertain position.

364. *juliginosa* C. Chr.

Subgenus I. Lastrea Bory, emend. C. Chr.

All indigenous tropical American species of this large subgenus are bipinnatifid or bipinnate and were all described in my earlier papers with the exception of some few, which have been described by myself and other pteridologists since the publication of the first part of this monograph. Below I mention the newer species I have seen, and add the original diagnosis of those described by myself. *D. Rosei* Maxon I have not seen, but it is evidently a good species and, therefore, I place it below in its proper place with number. On the other hand two new species from South Brasil, described by Prof. ROSENSTOCK fall presumably under species dealt with by me before, viz *D. janeirensis* Ros. Hedwigia **56**: 367. 1915 from Serra do Itatiaya, which is scarcely different from *D. rivularioides*, and *D. Tamandarei* Ros. l. c. 365-366 from São Paulo, which is probably a form of the variable *D. pachyrachis*. A third species described by ROSENSTOCK, *D, Herzogii* (Medd. Rijk's Herb. Leiden nr. 19: 15. 1913) from Bolivia, is possibly a form of *D. rudis*. These three newer species I have not listed. Some new varieties of old species and some new localites are added below.

The subgenus *Glaphyropteris* I now prefer to treat as a section of *Lastrea;* thus enlarged this subgenus (or genus) is very well delimitated and cannot be confounded with any other subgenus as far as the bipinnatifid-bipinnate species are concerned. Whether the subgenus really includes also decompound species may be doubted. The Old-World is inhabited by several decompound species, which cannot be referred either to *Eudryopteris, Ctenitis* or *Polystichopsis;* it is probable that some of these species must be considered decompound Lastreas. One of these species has of late years been recorded rather frequently from South America, probably escaped from gardens, it is

Dryopteris setigera (Bl.) O. Ktze.

Frequent round Rio Janeiro, f. inst. GLAZIOU nr. 15761 (B) and also in the southern Brazilian states and adjacent parts of Uruguay and Argentina (f. inst. S. Catharina, Blumenau, HAERCHEN, ed. Ros. Fil. austr. bras. exsic. nr. 205 (B). — This species is easily distinguished from all American decompound species by needle-like white long hairs without Ctenitis-hairs and nearly without scales; its quadripinnatifid lamina is not polystichoid as species of *Polystichopsis*; the small exindusiate sori have the sporangia intermixed with long whitish hairs. *D. setigera* is in many forms widely spread through South and East Asia and Polynesia.

Additions to Part I.

3. **D. sancta** (L.) O. Ktze.; Mon. I. nr. 56. — In Sto. Domingo this species varies considerably. I have noted the following varieties:

1. *typica* C. Chr. Smiths. Misc. Coll. **52**: 379, including the var. *strigosa* C. Chr. and var. *hirta* Jenm. C. Chr. l. c., which differ only by the more or less pubescent leaves, while the typical form is quite glabrous. — Eggers nr. 2512 b, 2512, Picarda nr. 312, 1180, 606, 685, 727 (B).
2. var. *Balbisii* (Spr.) C. Chr. Vid. Selsk. Skr. VII. 4: 296 f. 20. This very characteristic variety, which was originally described by Sprengel after specimens from Porto Rico, Bertero nr. 796 (B!) and erroneously by Kuhn identified with *D. Sprengelii*, is not rare in Sto. Domingo: Eggers nr. 2540, 2540 b, 2780, Weinland nr. 56, J. N. Rose nr. 4386 (B). Underside of lamina glandulose, glabrous or slightly strigose on the ribs. Sori apparently exindusiate.
3. var. *portoricensis* (Kuhn) C. Chr. Smiths. Misc. Coll. **52**: 380. — Like var. *Balbisii*, but rather hairy throughout, especially on rachis, ribs and upperside, scarcely glandular beneath. Sori indusiate; indusia subpersistent, ciliate and with a few glands. — Fuertes nr. 1085 (B).
4. var. *terminalis* (Kuhn) C. Chr., Fedde Repert. **15**: 26. 1917 (*Aspidium terminale* Kuhn, in sched.). — In general habit, texture and cutting fully like var. *Balbisii*, but still larger, nearly tripinnatifid, differing from the two former varieties by its non-attenuate lamina, i. e. it lacks the dwindling pinnæ below, the lowermost pair of pinnæ being not much shorter than the following ones. Rachis, costæ and costulæ beneath very short hairy, surfaces otherwise glabrous and eglandulose. Veins in larger pinnulæ about 8-jugate, often forked, remarkably thick, bearing the exindusiate sori near their apex in the teeth of the segment or pinnule, nearly exactly as shown in my figure of var. *Balbisii*. In this respect it resembles *D. limbata*, to which species Kuhn wrongly referred it. — It is not improbably a distinct species.

Sto. Domingo, in sylvis montis Isabel de la torre, Eggers nr. 2775 (B).

6. **D. consanguinea** (Fée) C. Chr. — Also Porto Rico, Sintenis nr. 1753 (B). —

The presence of a distinct indusium in *D. sancta* var. *portoricensis* makes it doubtful whether the form from the Lesser Antilles referred by me to *D. consanguinea* can be safely distinguished from *D. sancta*. The pinnæ and segments figured by me belong, I now believe, to a small form of *D. limbata*. But there occurs in some of the islands, especially Martinique, Dominica and Guadeloupe, and also Porto Rico (Sintenis 1753) a smaller form, which perhaps is the true *consanguinea*. This form is as to important characters, size, glandular underside, unequal-sided pinnæ, scarcely distinguishable from the typical *D. sancta*, and it is by nearly all authors referred to that species. Still it differs materially by its distinct, persistent glabrous or slightly ciliated indusia, and further it differs by the shape of the segments, which

are attenuated towards the apex, sometimes nearly triangular, not as those of *D. sancta* linear. Thus it diverges from *D. sancta* in the direction of *D. opposita*.

11. **Dryopteris rupicola** C. Chr. Fedde Repert **15**: 24. 1917.

Type from Sto. Domingo: prope Constanza ad Valle nuevo, in rupibus 2270 m., Eggers nr. 2157 (B!),

Lastrea e sectione *D. oppositae* rhizomate erecto, apice squamis nonnullis duris, castaneis vestito. Stipitibus caespitosis, numerosis, 2—4 cm longis, vix 2 mm crassis, basi parce squamosis, glabris, rigidis, stramineis. Lamina lanceolata, ad 40 cm longa, medio 8 cm lata, versus basin longissime et gradatim decrescente, versus apicem pinnatifidum sensim attenuata, rigide coriacea, obscure viride, rachi supra strigosa excepta ubique glabra et eglandulosa vel subtus parcissime glandulosa, bipinnatifida. Pinnis numerosis, usque ad 30-jugis, sessilibus, inferioribus plerumque subopppositis, superioribus alternis, inferioribus c. 10-jugis sensim reductis, deltoideis, lobato-auriculatis, infimis trilobis minimis; medialibus maximis, horizontalibus, acuminatis, c. 5 cm longis, 7—8 mm latis, fere ad costam pectinato-pinnatifidis. Segmentis c. 15-jugis, patentibus vel parum obliquis, sinubus latis, rotundis separatis, marginibus integris revolutis, apice subacutis; basalibus longioribus posteriore auriculo rotundato rachin tegente instructo. Venis distantibus, 4—5-jugis, simplicibus, crassis, in pagina superiore scalpturato-elevatis. Soris parvis, submarginalibus, plerumque a margine revoluto tectis, exindusiatis. Sporangiis nudis.

In habit and size very similar to *D. opposita*, from which it differs by coriaceous, glabrous and eglandulose lamina with thick raised veins and narrower segments. From *D. scalpturoides*, which it resembles in texture and venation, it differs by the exindusiate sori, glabrous lamina with narrower pinnæ.

14. **D. leucothrix** C. Chr.; Mon. nr. 66.

var. *glanduligera* C. Chr. et Ros. Fedde Repert **12**: 471. 1913.

Varietas stipite deorsum pilis longis, albis, mollibus lanoso, facie frondis inferiore glandulosa nec (costis exceptis) pilosa, indusiis glandulis aureis instructis, minus dense pilosis, maturis evanescentibus a typo diversa.

Bolivia: North-Yungas, Polo Polo near Coroico, Buchtien nr. 3407 (C C, R).

15. **Dryopteris Rosei** Maxon, Smiths. Misc. Coll. **65**[8]: 10. 1915.

Peru: near Matucana, Dr. and Mrs. J. N. Rose nr. 18667 (not seen). By its setose indusia and long attenuate lamina evidently a very distinct species.

16. **D. panamensis** (Pr.) C. Chr. — Also S. Domingo: La Vega, Fuertes nr. 1800 (B).

18. **D. scalpturoides** (Fée) C. Chr. — Also Haïti, Picarda nr. 257 (B).

19. **Dryopteris Shaferi** Maxon et C. Chr. Amer. Fern Journ. **4**: 77. 1914. — Fig. 3.

Type from Cuba: Oriente, near Camp San Benito, J. A. Shafer nr. 4037 (W); also Camp la Gloria, Shafer nr. 8094, 8215 (W).

Lastrea rhizomate erecto, 2—3 cm alto 1 cm crasso, radicibus numerosis, ramosis, apice paleis paucis brunneis, subrigidis, parvis (2—4 mm longis), breviter ciliatis instructo. Stipitibus fasciculatis numerosis, rigidis, 4—6 cm longis, supra canaliculatis et brevissime puberulis, subtus teretibus glabrisque, esquamosis. Lamina lineari-lanceolatis, 20—30 cm longa, medio 4—6 cm lata, coriacea, griseo-viridi, breviter acuminata, versus basin gradatim angustata, pinnata-subpinnatifida; rachi brevissime puberula, pilis patentibus, acutis. Pinnis numerosis (usque ad 30—40 utroque latere), sessilibus, alternis vel suboppositis, divaricatis, linearibus, saepe falcatis, c. 4 cm longis, 3—4 mm latis, acutis vel breve acuminatis, costis subtus minute puberulis exceptis glabris, inferioribus 4—6-jugis auriculiformibus; marginibus pinnarum crenatis vel plus minusve pinnatifidis, medio et pagina inferiore profundius incisis, parte tertia exteriore saepe integra; segmentis obliquis, apice rotundatis, basalibus duobus auctis, subacutis vel rotundatis (pinnis subbiauriculatis). Venis supra prominulis, furcatis vel simplicibus in parte integra pinnæ, in segmentis pinnatis, 4—5-jugatis, basalibus supra sinum marginem attingentibus. Soris submarginalibus, saepe marginibus revolutis obtectis. Indusiis magnis, brunneis, reniformibus, hispidis. Sporangiis glabris.

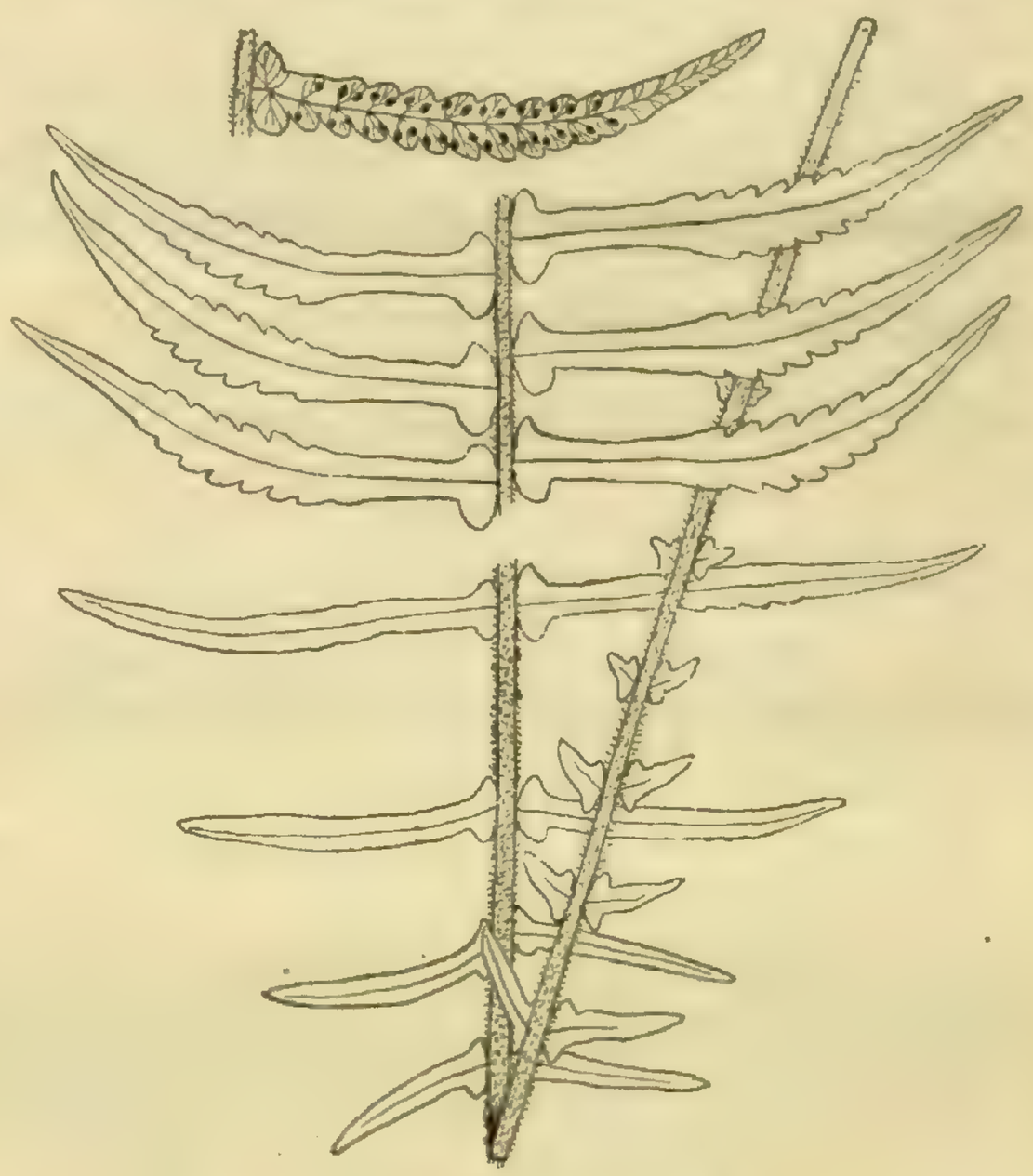

Fig. 3. ***D. Shaferi*** **Maxon et C. Chr.**
Base and middle part of a leaf and a fertile pinna, nat. size.

In general habit this species recalls ***D. sagittata*** by its narrow, hastate or sagittate pinnæ, several of which are nearly quite entire; the middle ones of larger leaves are scarcely incised halfway to the costa on the lower side that is usually more deeply cut than the upper one, the outer third of the pinnæ is often quite entire. In all essential characters *D. Shaferi* is, however, widely different from *D. sagittata*, but closely related to *D. scalpturoides*, differing from it mainly in its very narrow pinnæ, which are less incised and glabrous above.

20. **D. concinna** (H. B. W.) O. Ktze. — *Phegopteris adenochrysa* Fée, Gen. 245 (Martinique, Porto Rico) is certainly not *D. concinna* but probably the common *D. opposita*.

21. **Dryopteris subandina** C. Chr. et Ros., Fedde Repert. **12**: 472. 1913.

Type from Bolivia: Cataña ad fl. Ilimano, 2550 m, O. Buchtien nr. 3120 (R), nr. 3119, a smaller form (R).

Lastrea rhizomate breviter repente, demum suberecto, paleis ferrugineis, membranaceis, flaccidis, ovato-lanceolatis, breviter acuminatis, glabris, integerrimis vel dentes paucos glanduligeros ciliasve 1—2 gerentibus instructo; stipitibus fasciculatis (ad 6 in specimine), e basi flexuosa nigricante, paleacea erectis, stramineis vel ochraceis, nitidis, nudis, pilis brevibus albidis, mollibus praesertim in sulco adspersis, c. 20 cm (usque ad pinnas normales) longis, 3 mm fere supra basim crassis. Laminis elongato-oblongis, utroversus (deorsum maxime) acuminatis, pinnato-pinnatifidis, subcoriaceis, supra laete viridibus, subtus pallidioribus, pilis albidis, subulatis, strictis vel subhamatis ad nervos et in parenchymate utrinque vestitis glandulisque aureis facie inferiore hinc inde ornatis, ad 70 cm longis, 18 cm medio latis; pinnis numerosis, sessilibus, suboppositis, subapproximatis, subrecte patentibus, strictis vel subflexuosis, medialibus maximis ad 9 cm longis, $1^3/_4$ cm infra latis, e basi truncata, subaequali vel paullo utrinque adaucta lanceolatis, acuminatis; inferioribus gradatim diminutis et remotioribus, reflexis, demum auriculiformibus vel imis glanduliformibus; superioribus sensius abbreviatis et simpliciobus, in lobulos apicis brevis, pinnatifidi transeuntibus, segmentis ad 28 utrinque, paullo obliquis, linearibus, acutiusculis, margine revoluto, subintegerrimo, infimis c. 8 mm longis, 4 mm latis, inde sursum gradatim diminutis, in dentes apicis acuminati serrati sensim transeuntibus; rachibus costisque utrinque (infra densius) breviter hirtis; venis simplicibus, utrinque ad 9—10; soris supramedialibus, contiguis, maturis subconfluentibus; sporangiis nudis vel seta decidua hinc inde instructis: indusiis parvis, setis longis, albidis dense ornatis. (Rosenstoch descripsit).

This species comes next to *D. pachyrachis* and *D. supina* in general habit, it differs from them chiefly by its setose sporangia and by the indusia being furnished with long white hairs; by the latter character it is easily distinguished from *D. concinna*.

30. **Dryopteris Jimenezii** Maxon et C. Chr. Amer. Fern Journ. **4**: 79. 1913.

Type from Costa Rica: San Jerónimo, leg. C. Wercklé, herb. O. Jiménez nr. 567 (W!)

Lastrea rhizomate oblique-erecto, apice squamoso. Stipitibus fasciculatis, paucis (3—4), 5—10 cm longis, rigidis, canaliculatis, glabris, ad basin paleis castaneis, nitidis, integris, ovato-acuminatis 1 cm longis, deciduis dense onustis. Lamina lanceolata, 30—50 cm longa, medio 10—15 cm lata, sursum in apicem pinatifidum gradatim attenuata, versus basin abrupte angustata, atroviridi, tenuiter membranacea vel firme herbacea bipinnatifida. Rachi gracili, pilis adpressis brevibus parum pubescente. Pinnis alternis suboppositisve, 2—3 cm inter se remotis sessilibus, 4—5-jugis inferioribus auriculiformibus, medialibus 7—8 cm longis, 1.5—1.8 cm latis, acuminatis, ad costis utrinque ut rachi parum pubescentibus, paginis pilis adpressis perpaucis in-

structis vel fere glabris, ad alam 1 mm latam pinnatifidis. Laciniis c. 1 cm longis, 2—3 mm latis, obtusis vel subacutis, parum obliquis, versus basin latioribus, sinubus acutis latisque separatis, marginibus regulariter dentatis vel crenatis; laciniis basalibus ceteris similibus vel paullo brevioribus. Venis indivisis, distinctis, distantibus, c. 6 utroque latere, in dentes excurrentibus. Soris parvis, supramedialibus, exindusiatis; sporangiis paucis, mox deciduis, glabris.

Related to *D. supranitens* Christ and *D. tablaziensis* Christ, both from Costa Rica, resembling them in the presence of numerous scales on the stipe below, a character rather rare within the subgenus *Lastrea*. From the former it differs in its non-glossy upper surface and its patent and toothed segments; from the latter in its shorter pinnæ, nearly glabrous rachis, and toothed segments. A pronounced character is found in the broad bases of the segments. The veins are remarkably distant and less oblique than in most other species.

33. **D. hydrophila** (Fée) C. Chr. — Also Martinique, Père Duss nr. 1583 (B).

38. **Dryopteris retusa** (Sw.) C. Chr. Ind. 288. 1905.

Syn. *Polypodium retusum* Sw., *P. pusbescens* Raddi, *Aspidium Kaulfussii* Link (see Vid. Selsk. Skr. VII. 4: 276); *Dryopteris* Raddii Ros. Hedwigia 56: 367. 1915.

I think now that the numerous South Brazilian forms, which in my first paper (l. c.) I referred to *D. oligocarpa*, may very naturally be separated from that species under the name of *D. retusa;* the name *D. Raddii* Ros. for *P. pubescens* Raddi seems superfluous.

39. **Dryopteris ptarmiciformis** C. Chr. et. Ros. Fedde Repert. 12: 472. 1913.

Type from Bolivia: North-Yungas, Polo-Polo near Coroico, O. Buchtien nr. 3545 (? an 3435) (R!).

Lastrea rhizomate erecto, paleis lanceolatis, ferrugineo-brunneis, margine pilosulis vestito. Stipitibus dense fasciculatis, basi nigrescente, paleacea excepta stramineis, nudis, in sulco hirtis, ceterum pilis paucis brevibus vestitis vel glabrescentibus usque ad pinnas normales ca. 12 cm longis, $1^1/_3$ mm crassis. Laminis deorsum obsoletis, pinnis inferioribus 3—4-jugis ad meras auriculas reductis vel glanduliformibus, sursum elongato-ovalibus, acuminatis, herbaceis, laete viridibus, in facie superiore pilis albidis subulatis prope marginem adspersis, utrinque obscure albidoglandulosis vel furfuraceis, c. 20 cm longis, 10 cm latis, pinnato-pinnatifidis. Pinnis (non reductis) c. 12-jugis, brevissime petiolatis, iis inferiorum 1—2-jugum plerumque reflexis, ceteris erecto-patentibus, strictis, medialibus maximis c. 6 cm longis, vix $1^1/_2$ cm latis, e basi subaequali lineari-lanceolatis, breviter acuminatis, usque fere ad costam inciso-lobatis; inferioribus parum abbreviatis, infimis — transitum ad pinnas auriculiformes formantibus — ad 1 cm longitudinis repente reductis; superioribus gradatim diminutis, in lobos apicis demum serrati vel subintegri sensim

transeuntibus. Segmentis densis, linearibus, parallelis, valde obliquis, obtusis vel oblique acutis, ca. 8 mm longis, 2½ mm. latis, basalibus binorum jugum inferiorum paullo diminutis, ceterorum proximis aequalibus. Rachibus antice dense strigoso-hirtis, postice pilis patentibus brevibus (paucis longioribus intermixtis) puberulis; costis supra breviter strigosis, subtus cum costulis glabris; nervis lateralibus simplicibus, pellucidis, c. 6-jugis. Soris margini appropinquatis; indusio firmulo, persistente, margine breviter glanduloso-fimbriato, ceterum glaberrimo, sporangiis glabris. (Rosenstock descripsit).

Allied to *D. oligocarpa* from which it differs in its more glabrous frond, distinct indusia, oblique segments (recalling those of *D. ptarmica)* and suddenly reduced lower pinnæ. — Dr. Rosenstock says that he has the same species from Petropolis, near Rio de Janeiro, Th. Schnapp nr. 51, which I have not seen.

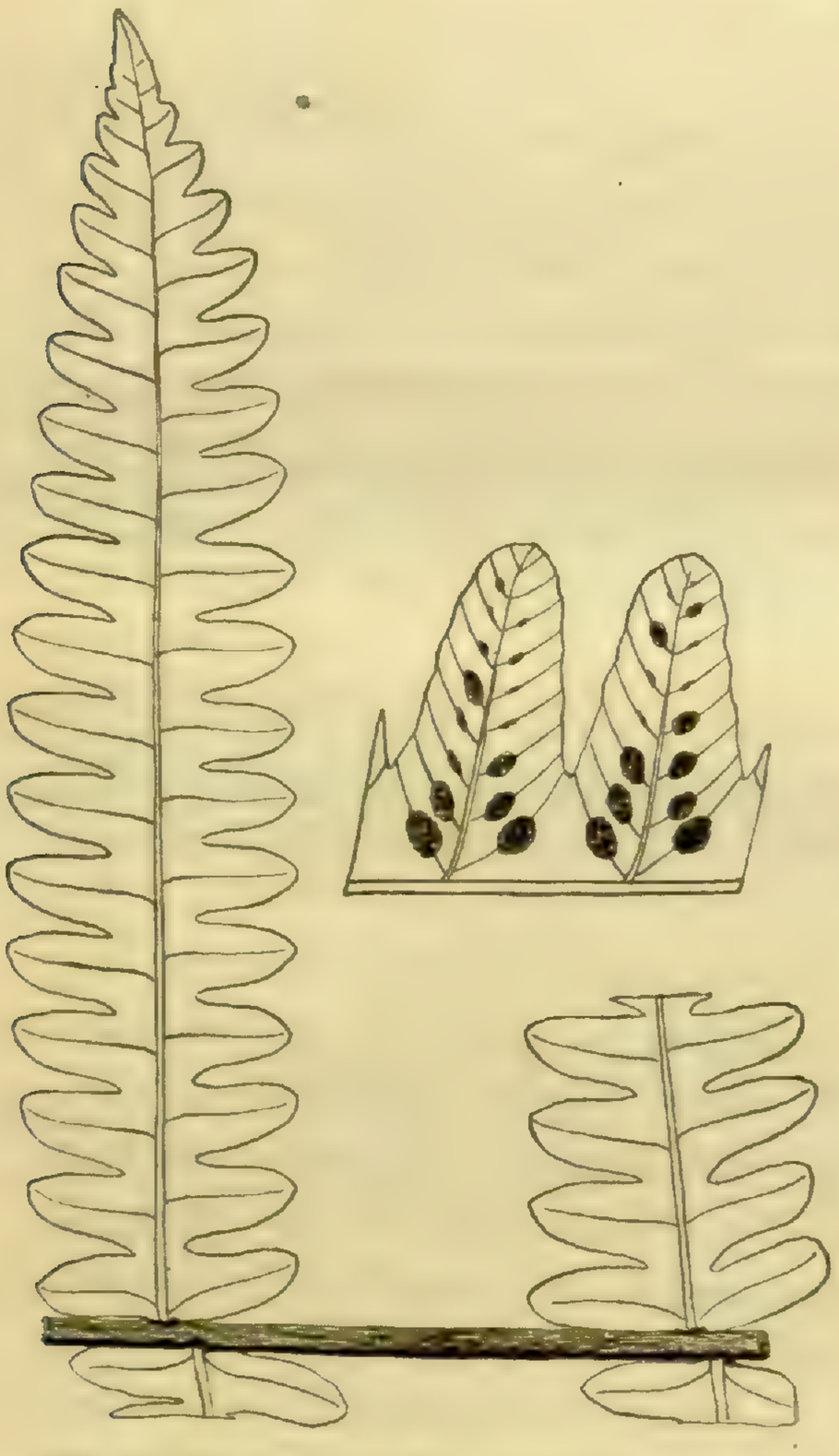

Fig. 4. *D. arborea Brause.* Pinna from the upper third of a leaf, nat. size, and two segments × 2.

62. **D. pachyrachis** (Kze.) O. Ktze.

Probably this includes several forms of specific value. *D. Tamandarei* Ros. Hedwigia **56**: 365—366. 1915 presumably falls under it; Brazil: São Paulo, Brade nr. 6534 (not seen).

71. **Dryopteris arborea** Brause, Fedde Repert. **13**: 294. 1914; C. Chr. Amer. Fern Journ. **4**: 80. 1914. — Fig. 4.

Syn *D. roraimensis* Brause, Notizbl. bot. Gart. u. Mus. Berlin-Dahlem **6**: 109. 1914 (non C. Chr. 1905).

British Guiana: Mt. Roraima, Ule nr. 8526 (B!).

A very interesting species with a caudex said to be 1—2 meters high and with very long and narrow leaves (about 1½ m long by scarcely 20 cm broad). Rachis atropurpureous, pinnæ opposite, distant, in cutting and venation resembling *D. pachyrachis*, articulated to rachis. The whole leaf by its length much resembles that of *D. euchlora* var. *inaequans*, but its pinnæ are different; its nearest ally is certainly *D. atropurpurea* Hieron, which perhaps is a variety of *D. euchlora* and has a similar castaneous rachis, but its pinnæ closely resemble those of *D. conformis*.

81. D. diplazioides (Desv.) Urban.

Also Martinique, Père Duss nr. 4126 (B), Porto Rico, Sintenis nr. 6445 (B); Bolivia: San Antonio, Buchtien nr. 1126, 1130 (R).

92. D. rivularioides (Fée) C. Chr.

I cannot from the description alone distinguish *D. janeirensis* Ros. Hedwigia **56**: 367. 1915 from Rio Janeiro: Serra do Itatiaya, Tamandaré and Brade nr. 6462.

116. D. rudis (Kze.) C. Chr.

Phegopteris impressa Fée, 8. mém., 90 (Mexico, Schaffner nr. 218. 1854) is f. Fournier this species. — Also Bolivia, Buchtien nr. 494 (R).

D. Herzogii Ros. Meded. Rijks Herb. Leiden nr. 19: 15. 1913 from Bolivia (Herzog nr. 2215) according to the description is closely related to *D. rudis* and *D. Engelii*.

125. D. pteroidea (Kl.) C. Chr. var. *subsagittata* C. Chr. var. nov.

A type differt: pinnulis basi utrinque auriculatis, auriculis deltoideis. — Stipe nearly 1 m long with about 3 pairs of abortive glanduliform pinnæ above and few scales below.

Sto. Domingo: prope Barabona, Fuertes nr. 1537 (B).

A most interesting discovery of this andine species in the West Indies; the described character excepted, the specimen is exactly like the typical andine form.

Subgenera II, III, IV. Steiropteris C. Chr., Cyclosorus (Link) Leptogramma J. Sm.

All species of these three subgenera are pinnate-bipinnatifid and were described in the first part of this monograph. No species has been described since the publication of that part, and I have very few additions to make here.

154. D. patens (Sw.) O. Ktze.

I add some more important collector-numbers. Eggers nr. 6541, 6645 (St. Vincent); 903, 906 (Dominica); 2654 (Sto. Domingo). 1728 (Haïti); 4632, 5281 (Cuba). Sintenis nr. 1719, 2511, 5661 b (Porto Rico). Fuertes nr. 970, 1550 (Sto Domingo); Picarda nr. 381, 391, 973 (Sto. Domingo). Père Duss nr. 903, 906 (Martinique). — var. *dependens* Eggers nr. 3355 (Haïti); Garber nr. 137 (Porto Rico). (All specimens in B; hb. Krug & Urban).

156. D. normalis C. Chr.

Also Bahamas: New Providence, Eggers nr. 4178 a (B). Cuba: Rio Seco, Eggers nr. 4729 (B). Jamaica, Harris nr. 7294 (B).

159. D. serra (Sw.) O. Ktze.

Sto. Domingo, Eggers nr. 1733, 2156, 2212; Fuertes nr. 784, 1009; Picarda nr. 382, 622. Cuba: Eggers nr. 4656, Shafer nr. 12264 (all B). — The form intermediate between *D. serra* and *D. oligophylla*, mentioned Mon. I p. 187 was also collected in Sto. Domingo by Eggers nr. 1747 and Fuertes nr. 792 (B). It is not improbably a distinct species.

160. D. oligophylla Maxon f. *typica*.

Also Sto. Domingo, Eggers nr. 1636, 2804 (B), and anew in Cuba; Oriente, Shafer nr. 8956 (B).

164. Dryopteris dentata (Forsk.) C. Chr. comb. nov.

Syn. *Polypodium dentatum* Forsk. Fl. ægypt. arab. 185. 1775.
Polypodium molle Jacq. 1789.
Dryopteris mollis Hieron.; C. Chr. Mon. I. 191 nr. 200.

A specimen with Forsskål's original label of his *P. dentatum* is in the separate *Herbarium Forsskålei* in the Botanical Museum of Copenhagen; it was collected in the mountains of Southwestern Arabia (Yemen). I have thoroughly examined the specimen and find that it belongs to the form which occurs frequently through Africa and the Atlantic Islands and which I cannot distinguish from the most common West Indian form, *Aspidium violascens* Link. *Polypodium molle* Jacquin 1789 is invalidated by *Allioni's P. molle* 1785 and another name for the present species was needed; thus it is fortunate that Forsskål's name from 1775 is fully available.

The species was collected also in Guadeloupe, Père Duss nr. 1586, 4043, 4047 and Mazé nr. 290, 1015 (B). Further by Eggers nr. 5855 (Tobago), 6028 (Grenada), 1583, 3303 (Sto. Domingo). Fuertes nr. 1440 and Picarda nr. 1705 (Sto. Domingo). Broadway nr. 3587 (Tobago), 2534 (Grenada). Sintenis nr. 2172, 2589, 2830, 3047 (Porto Rico). H. H. Smith nr. 811, 891 (St. Vincent). (All B., hb. Krug & Urban).

Nephrodium grenadense Jenm. Gard. Chr. III. 15: 198, 1894, *Dryopteris gr.* C. Chr. Ind. 299 from Grenada, Sherring, is no doubt one of the many forms of *D. dentata* with lax venation (basal pair of veins now united now free).

165. D. gongylodes (Schkuhr) O. Ktze. —

Now recorded from Sto. Domingo: Prov. de la Vega, Fuertes nr. 1613 (B).

Aspidium continuum Desv, Berl. Mag. 5: 320. 1811 from Brazil is this species (Herb. Mus. Paris!).

Subgenus V. Goniopteris (Presl) C. Chr.

No species of this most distinct subgenus is decompound; I have little to add to my former treatment.

170. D. Cumingiana (Kze.) O. Ktze.

This most distinct species was rediscovered in Panamá by PITTIER nr. 4222 (Rio Fató valley) and 4470 (forest of the upper Mamoni River) (W, H, CC). The specimens agree exactly with KUNZE's excellent description and figure.

175. **Dryopteris Fuertesii** Brause in Urban, Symb. Ant. 7: 485. 1913.

Type from Sto. Domingo: Las Filipinas, Prov. Barahona, FUERTES nr. 1017 (B!).

Probably a subspecies of *D. scolopendrioides*, with which it agrees in almost all characters; it differs from that species by its very long stipe (up to 30 cm) and by some of the leaves (not all) being nearly tripartite; at the base of the lamina are a pair of erect lateral pinnæ, which are shorter than the central pinna.

176. D. guadalupensis (Wikstr.) C. Chr. var. setulosa n. var.

Rachis and costæ beneath clothed with long simple hairs; stellate hairs proportionally few. Free pinnæ 5—8-jugate.

Haïti, prope Payan, PICARDA nr. 208 (B).

182. D. asterothrix (Fée) C. Chr.

Also Sto. Domingo: ad flumen Mameges, EGGERS nr. 2503, 2528 (B).

183. D. sclerophylla (Kze.) C. Chr.

Also Sto. Domingo: Barahona, FUERTES nr. 1454, 1572 (B).

184. D. asplenioides (Sw.) O. Ktze.

Sto. Domingo, EGGERS nr. 1578, 1866 b, 2660, 2806; von TÜRCKHEIM nr. 3217 (all B).

213. D. nephrodioides (Kl.) Hieron. f. *guadalupensis* (Fée).

Also Sto. Domingo, FUERTES nr. 1549, v. TÜRCKHEIM nr. 2721 b. (B).

The Andine form of this species with the basal veins united and with the hairs of the under surface often anchor-shaped, varies in the density of pubescence. I have in the first part referred them all to *var. Biolleyi*; and if they really all belong to a single variety or subspecies, the name of this much be changed into

var. nemoralis (Sod.) comb. nov.

Syn. *Nephrodium nemorale* Sod. Cr. vasc. quit. 267. 1893; *Dryopteris nemoralis* C. Chr. Ind. 279. 1905. — The type-specimen of SODIRO's species (RB!) shows at once that it belongs to one of the forms of *D. nephrodioides*, which is frequently collected in Ecuador and Peru; above the basal pair of anastomosing veins are about two pairs of veins connivent to the acute sinus. Underside with many minute stellate and anchor-shaped hairs. Near this variety is

var. **glandulosa** C. Chr. et Ros. Fedde, Repert. **13**: 473. 1913.

Differs from the former variety by its underside being glandulose by minute, glistening glands, a character not observed before in this subgenus.
Bolivia: Polo-Polo, O. Buchtien nr. 3410 (R).

221. **D. straminea** (Bak.) C. Chr. — To this species I refer

Polypodium trinidadense Jenm. Gard. Chr. III. **18**: 235. 1895. *Dryopteris trinidadensis* C. Chr. Ind. 298. 1905; Amer. Fern Journ. **4**: 81.

Jenman's species was collected in Trinidad: Maiacas Falls, by J. H. Hart, Bot. gard. Herb. Trinidad nr. 5886 (Kew!). The single, rather imperfect specimen in most characters: size, colour, perfect glabrous frond, stramineous costæ, shape of pinnæ, thickened margins, sori, kind of venation, fully agrees with the type specimen of *D. straminea*. It differs from it in its acute or even submucronulate teeth, the serrated apex of the pinnæ, the non-gemmiferous rachis (an accidental character) and by having only 2 or 3 pairs of lateral veins. I consider these differences of little importance. The occurrence of a Venezuelan species in Trinidad is not surprising. Both *D. straminea* and *D. trinidadensis* is described after a single leaf, and from such scanty material it is impossible to decide whether the two proposed species are really identical.

227. **D. tetragona** (Sw.) Urban.

Also Amazonas Santarem, Spruce s. n. (L).

var. **guadalupensis** (Fée).

Also in Martinique, Duss nr. 1585 (B) and a form intermediate between that variety and the typical form in Antigua, Rose nr. 3322 (B).

228. **D. megalodus** (Schkuhr) Urban.

Also Tobago, Broadway nr. 3986 (B). — Sto. Domingo, Eggers nr. 27 and 2767 Fuertes nr. 1099 (B). Cuba: Loma del Jaguey, Eggers nr. 5286 (B).

230. **D. Poiteana** (Bory) Urban.

Also Barbados, Eggers nr. 7287 (B). — Sto. Domingo Eggers nr. 2618, 2661 b and Fuertes nr. 1383, 2613, 2734 (B). — Porto Rico, Sintenis nr. 875, 1357, 1404, 2590 b, 2772 b, 5965 b (B). — Eggers nr. 5744 b (Tobago), 5995 (Grenada).

Subgenus VI. Meniscium (Schreber).

I have above (pag. 14) enumerated 13 American species of *Meniscium*, which, however, are not critically examined as are the species of the other subgenera. Be-

cause of the war it was not possible to get the comprehensive material of the U. S. National Herbarium, and the material at hand is not sufficient for a monographic study of the species such as I have carried out in the other subgenera. There are probably several other species besides the 13 enumerated. Two new combinations of name have been published since the publication of the first part:

237. **Dryopteris membranacea** (Mett.) C. Chr. Ind. Suppl. 35. 1913.

Syn. *Phegopteris membranacea* Mett. Fil. Lechl. II. 22. 1859.
Peru: St. Gavan, LECHLER nr. 1785.

240. **Dryopteris macrophylla** (Kze.) C. Chr. Ind. Suppl. 35. 1913.

Syn. *Meniscium macrophyllum* Kze. Flora 1839 Beibl. I. 44; Farrnkr. 93 t. 44. — *Phegopteris macrophylla* Mett. Fil. Lechl. II. 22 cum syn. — Bahia, Guiana and Trinidad.

Subgenus VII. Eudryopteris C. Chr.

In the first part of this monograph I have dealt with all the known species from tropical America belonging to this subgenus. Out of the 11 species mentioned the seven (one of which must be excluded) have a bipinnate-quadripinnatifid lamina. These species can always and easily be distinguished from other decompound species by 1) the decurrent midribs of the ultimate pinnules or segments, 2) the abscence of simple or articulated hairs, also along the costæ and costulæ above, and 3) the large, reniform and generally persistent indusia. In general structure the order of pinnæ and pinnulæ is rather lax; commonly the basal secondary pinnæ of the middle pinnæ are nearly opposite. The basal pair of pinnæ is rarely much the largest, more commonly a little shorter than the second pair, the lamina becoming ovate in general outline, and their lower pinnulæ are seldom much produced, in several species not at all.

To my former treatment I have only a few corrections and additions to make here.

248. **D. paleacea** (Sw.) C. Chr.

I have now seen a fragment of the type-specimen in S. The species was recently recollected in Sto. Domingo by v. TÜRCKHEIM nr. 3583 (B).

257. **D. mexicana** (Pr.) C. Chr.

Additional synonym: *Dryopteris patula* var. *Moreliæ* Christ in Lecomte, Not. syst. 1: 234. 1910. — Cerro Azul pr. Morelia, ARSÈNE nr. 5167 (CC, RB); ROSENSTOCK, Fil. mex. exs. nr. 3 (Rg).

261. D. patula (Sw.) Und.

New localities: Brazil: Matto Grosso, Palmeiras, LINDMAN nr. A. 2397 (Rg). — Bolivia: Pinos near Tarija, FIEBRIG nr. 3133 (Rg). — Sto. Domingo: Valle nuevo, EGGERS nr. 2205 (B).

D. ulvensis Hieron. must be excluded from this subgenus; it is a form of *D. effusa*.

262. D. Karwinskyana (Mett.) O. Ktze.

Additional synonym: *Nephodium sphaerocarpum* var. *glandulosum* Hook. sp. 4: 139. 1860. — Also found in Costa Rica: Carrillo, WERCKLÉ nr. 17427 (B); JIMÉNEZ nr. 247 (W). — This species is very different from the others, and its systematical position is not clear. It shows some resemblance to certain species of § *Ctenitis*, especially of the group of *D. hirta*, but as a whole it is best placed under *Eudryopteris*.

D. Wolfii Hieron., placed with doubt under *Eudryopteris*, is identical with *D. biserialis* (Bak.) C. Chr. Mon. 111 nr. 52.

A couple of specimens in B, said to be collected in Panama by SEEMANN nr. 13001, belong to D. aemula (Ait.) O. Ktze. and are exactly that form which was frequently cultivated under the name *Nephrodium Foenisecii* Lowe. It is possible that the labels are wrong and that the specimens were taken from cultivated plants, or, perhaps, originate from Madeira or the Azores. At least I dare not list the species as an American one on those specimens alone.

Subgenus VIII. Stigmatopteris C. Chr.

In Part I I have described only one bipinnate species of *Stigmatopteris & Eustigmatopteris*, viz. *S. prasina* (Bak.) C. Chr. Now I know three species, that may be distinguished thus:

Basal secondary pinnules broadly adnate to the costa of the primary pinna, 4 cm long, 1 cm broad, lobed scarcely halfway to the midrib into truncate and slightly repand lobes. Veins 3-jugate, simple. *S. Lechleri* (Mett.) C. Chr.

Basal secondary pinnules free, sessile, incised $^3/_4$ of the way down into toothed or serrulate lobes.

Pinnules 4—5 cm long, 10—12 mm broad at base; lobes with 2—3 subacute, oblique teeth on each side. Veins 4-jugate, simple. Sori supramedial. *S. cyclocolpa* (Christ) C. Chr.

Pinnules about 10 cm long, $2^1/_2$ cm broad at base; lobes serrulate with 4—5 low crenatures on each side. Veins 6—8-jugate, mostly furcate. Sori medial. *S. ecuadorensis* n. sp.

277. Stigmatopteris Lechleri (Mett.) C. Chr. comb. nov. — Fig. 5 b.

Syn. *Phegopteris Lechleri* Mett. Fil. Lechl. 2: 25. 1859.

Stigmatopteris prasina (Bak.) C. Chr. Mon. 79 nr. 25 cum syn.

Type from Peru: St. Gavan, LECHLER (B!)

A comparison between the type-specimen and SPRUCE's nr. 4719, the type of *Pol. prasinum* Bak., shows at once that the two are absolutely identical. *Ph. Lechleri* Mett. was, *mirabile dictu*, in Index Fil. referred to *Dryopteris subincisa* as a subspecies. The same species was gathered in Ecuador: San Miguel, by SODIRO nr. 49 (Budapest); SODIRO's description of *Pol. prasinum*, Cr. vasc. quit. 297, corresponds, however, best with *S. ecuadorensis*, described below.

278. **Stigmatopteris cyclocolpa** (Christ) C. Chr. Amer. Fern Journ. 4: 82. 1914. — Fig 5a.

Syn. *Polypodium cyclocolpon* Christ, Bull. l'Herb. Boiss. 4: 659. 1896.

Dryopteris cyclocolpa C. Chr. Ind. 260. 1905.

Type from Costa Rica: Forêts de Tsâki, Talamanca, TONDUZ nr. 9480 (W!).

Leaf grass-green, firmly herbaceous or membranous, distinctly pellucido-punctate, perfectly glabrous but with some red-brown narrow scales on the lower part of the midrib of the pinnæ beneath. Lamina bipinnate-tripinnatifid; pinnæ short-stalked, lanceolate, 25—30 cm long, 8—10 cm broad, fully pinnate in the lower two-thirds. Pinnulæ 4—5 cm long, 10—12 mm broad at the base, the lower ones sessile but free, the upper broadly adnate and decurrent, from the somewhat unequal base gradually attenuated into an acuminate, serrate apex, lobed $^{2}/_{3}$—$^{3}/_{4}$ of the way to the midrib. Lobes rectangular, 2—4 mm broad, serrate especially at the obtuse or truncate apex. Veins mostly 4-jugate in the lobes, simple. Sori supramedial, without indusium-like scale. — Not easily confounded with any other species.

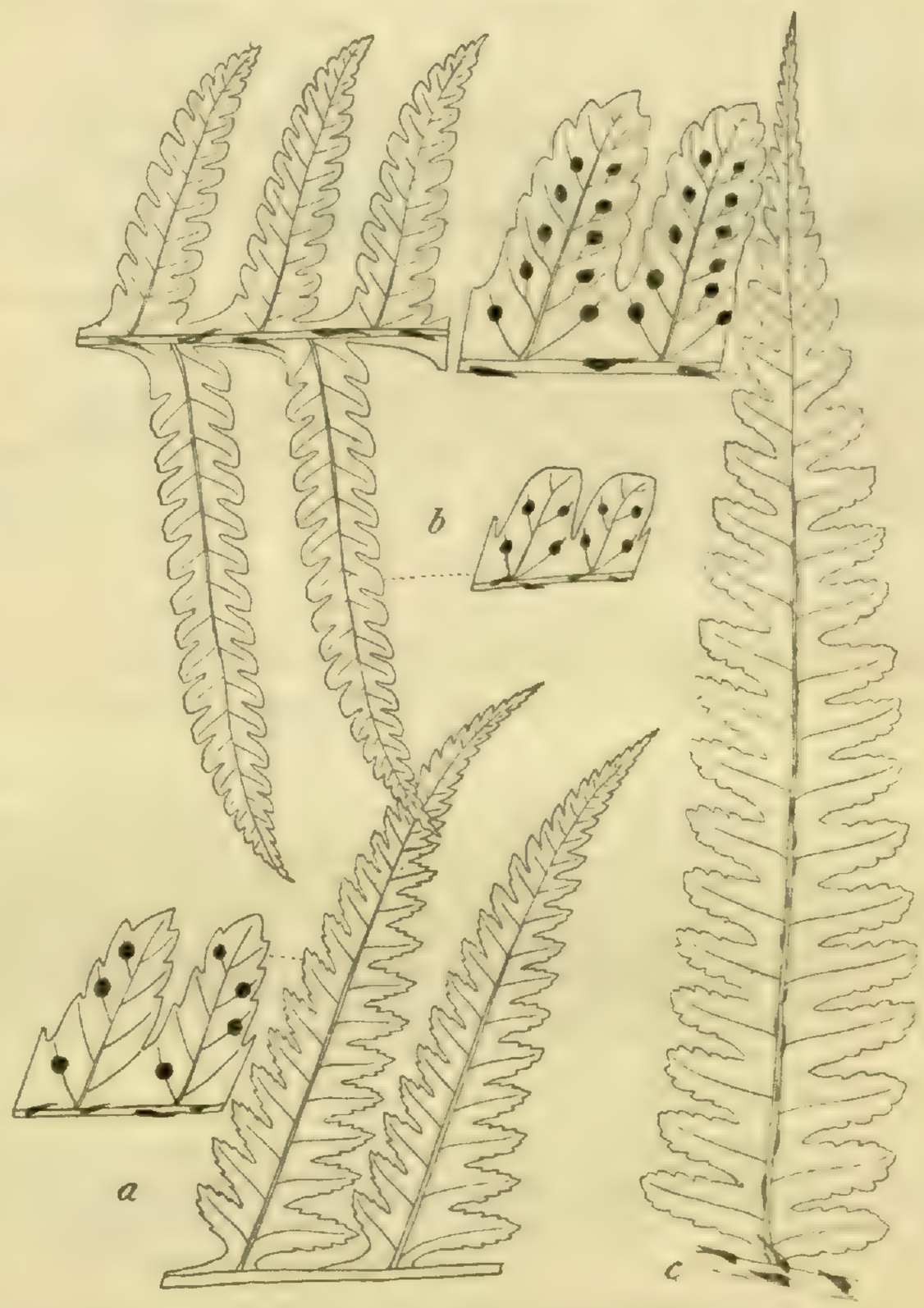

Fig. 5. Pinnæ in nat.-size and segments × 2 of *a. St. cyclocolpa*, *b. St. Lechleri*, *c. St. ecuadorensis*.

279. **Stigmatopteris ecuadorensis** C. Chr. sp. nov. — Fig. 5c.

Syn. *Dryopteris ecuadorensis* C. Chr. ms.

Polypodium prasinum Sodiro, Cr. vasc. quit. 297. 1893, pro parte.

Type from Ecuador, leg. Sodiro (Fragment in CC, from Herb. Christ).

As suggested in Part I of this monograph pag. 79 this may be considered specifically different from *S. Lechleri (S. prasina).* It resembles more closely *S. cyclocolpa*, from which it differs by its larger size, its serrulate lobes and furcate veins. Sodiro's description of *Pol. prasinum* fits this species very well, and here I add only some additional notes.

Leaf grass-green, herbaceo-membranaceous, distinctly pellucido-punctate, slightly scaly on the midribs beneath. Pinnæ stalked, 40—50 cm long, fully pinnate in the lower two-thirds. Pinnulæ 10 cm long, 2—2½ cm broad, the lower ones free, the upper adnate and decurrent from an equal base oblong-lanceolate, acuminate with serrate apex, incised ¾ of the way down. Lobes 4—5 mm broad, oblong, obtuse, with 5—6 obtuse or rounded crenae on each side. Veins about 6 to each side, as a rule furcate, the anterior branch very short and soriferous. Sori medial.

Phegopteris perforata Fée, Gen. 248 from unknown locality is certainly a *Stigmatopteris;* it is of no importance to know what such a »species« may be, badly described on imperfect specimen of unknown origin. The name ought to pass into oblivion.

282. **D. subobliquata** (Hook.) O. Ktze.

Polystichum? inerme Fée, Gen. 281. 1852 from French Guiana (Leprieur nr. 188) is probably this species judging from the poor description.

283. **Dryopteris abbreviata** (Schrad.) O. Ktze. Rev. **2**: 812. 1891.

Syn. *Aspidium abbreviatum* Schrad. Gött. gel. Anz. **1824**: 869; Baker Fl. bras. 1[2]: 464, tab. 29 f. 5, 6, tab. 46 f. 1, tab. 62.

Polystichum abbreviatum Pr. Epim. 58. 1849; C. Chr. Ind. 575, excl. the subspecies.

(For other synonyms see Index Fil.).

Type from South-Brazil, where it is not very rare.

As mentioned in the first part of this monograph (p. 82), *D. abbreviata* is closely related to *D. subobliquata,* mainly differing from it by its anastomosing veins, and even this character is not very constant; still it is generally much larger. In all essential characters the species agrees with the others united under the section *Peltochlaena* and its natural position is here, not in *Polystichum.*

Subgenus IX. Ctenitis C. Chr.

To this distinct subgenus (or genus) belong most of the decompound species of tropical America. I have little to add to my description of it in the first part, though I must add the most important character: the spores are always echinate. Several of the decompound species have only short, red-brown articulated hairs, which can always be found on the costæ above (see, however, *D. grandis)*; by these two characters: hairs and spores, the subgenus is absolutely different from the two former, *Eudryopteris* and *Stigmatopteris*. Also the scales are characteristic, generally clathrate. In the group of *D. subincisa* other hairs than the common *Ctenitis*-hairs occur; the costules of the species of that group are above strigose by antrorse, subulate hairs, which are paucicellular and only a modification of the short *Ctenitis*-hair, although not always distinctly articulated. Frequently the ordinary *Ctenitis*-hairs are to be found under the subulate ones; besides these hairs also others may be found, long, flexible, pluricellular or short, unicellular. From the subgenus *Parapolystichum* (*D. effusa* and allies), where articulated hairs also are found, the species of *Ctenitis* is different by the structure of the lamina, which is cyatheoid (see introduction).

All species of the groups 1—4 have an erect or oblique rhizome with fasciculated leaves, the fifth group, which includes a single American species only, *D. protensa*, differs from all others by its creeping rhizome with scattered leaves, that are are more or less tripartite; that species is thus very different from other American species, still it shows all important characters of *Ctenitis*.

I now know 66 American species of *Ctenitis*, of which 25 were dealt with in the first part. As shortly pointed out there (pag. 84—85) the species may be sorted into some rather distinct groups, and I now think the five groups characterized in the key below may be considered rather natural and well defined, although there are found some species that with equal right could be placed in two groups; such species are considered in the keys to the species of both groups.

Key to the Groups.

1. Rhizome erect with fasciculated leaves. Lamina bipinnatifid-quadripinnatifid, lanceolate or deltoid, not tripartite (see, however, *D. Hemsleyana*). 2
— Rhizome creeping with scattered leaves. Lamina generally distinctly tripartite; hairs all common *Ctenitis*-hairs. 5. Group of *D. protensa*, Sp. 349

2. All hairs short, articulated *Ctenitis*-hairs. 3
— Besides *Ctenitis*-hairs also other kinds of hairs are to be found; costæ and costules above strigose by antrorse, subulate often falcate hairs or long hairy by long pluricellular, flexible hairs. Basal posterior tertiary segment of tripinnatifid species generally broadly adnate to the costa of the pinna with its midvein running out from it. Bipinnatifid-decompound species of thick texture and broad ultimate segments 4. Group of *D. subincisa*, Sp. 318—348.

3. Lamina bipinnatifid (only *D. flexuosa* tripinnatifid); scales of stipe and rachis not hairlike or blackish (stipe and rachis not crinite), these of the costæ beneath rarely bullate; veins reaching the margin.
1. Group of *D. submarginalis*, Sp.s 284—298.
Lamina bipinnate-decompound, rarely bipinnatifid; stipe and rachi crinite by blackish, hairlike, patent or retrorse scales; scales of costæ and costules beneath most often bullate; the larger decompound species of this group have an ovate lamina, i. e. the basal pinnæ somewhat shorter than the following and their lower basal pinnula shorter than the folowing. Veins do not reach the margin.
2. Group of *D. hirta*, Sp. 299—312.
Lamina decompound, deltoid, i. e. the basal pinnæ are the longest and their lower basal pinnula much the longest. Very scaly, the scales thin, not clathrate, reddish, rarely blackish, these of the stipe beneath form a large tuft; bullate scales none. Basal posterior tertiary segment of an upper pinnula not broadly adnate to the costa of the pinna, and its midrib runs out from the base of the costule of the pinnula or above the base. 3. Group of *D. ampla*, Sp. 313—317.

1. Group of D. submarginalis.

With a single exception here belong species only which have a bipinnatifid lamina with simple veins. The species, which were described in the first part of this monograph, do not represent a single line of development, nor do all belong bipinnatifid species to this group. To the group of *D. hirta* I refer those Central-American species that have bullate scales or the stipe crinite by rigid dark brown scales; the two species *D. nigrovenia* and *D. Tonduzii* I retain here, but they are in some characters intermediate between this group and that of *D. hirta*. Also *D. vellea* I place here, but it is not unlikely that it should be referred to the *hirta*-group because of its bullate scales and geographical distribution, being the only West-Indian species referred to the group of *D. submarginalis*.

All species of this group lack shorter or larger common whitish or brownish subulate hairs; the costæ above are always rusty pubescent by the common short articulated hairs peculiar to the subgenus. Some few bipinnatifid species dealt with in the first part (no.s 48—53) I refer to the *subincisa*-group; they have furcate veins

and the costæ above strigose by longer setæ, still less so in *D. honesta* and *D. yungensis* (which perhaps are identical).

The only more divided species that I place here is *D. flexuosa*, described below; it seems related to *D. deflexa* and I cannot find any other natural position for it.

I have nothing to add to my former treatment of the bipinnatifid species belonging here.

D. laetevirens Ros. Hedwigia **56**: 368. 1915 from South Brazil is unknown to me.

298. **Dryopteris flexuosa** (Fée) O. Ktze. Rev. Gen. Pl. **2**: 812. 1891.

Syn. *Aspidium flexuosum* Fée, Cr. vasc. Br. **1**: 183 tab. 46 fig. 2. 1869.
Nephrodium flexuosum Baker, Fl. Bras. **1**^{2}: 483. 1870.
Phegopteris camptocavlon Fée, Cr. vasc. Br. **2**: 60 tab. 98 fig. 1. 1872—73.
Dryopteris camptocaulis C. Chr. Ind. 256. 1905.

Type from Brazil, near Rio Janeiro, leg. Glaziou nr. 2458 (H!); also nr. 4668 (B, H = *Ph. camptocavlon* Fée).

A most remarkable species of § *Ctenitis*, in several important characters totally different from all other decompound species but perhaps related to the bipinnatifid *D. deflexa* (Klf.) C. Chr. It was described separately both by Fée and Baker under the same specific name and well illustrated by Fée. Fée described it again as *Ph. camptocavlon*, which may be explained by the circumstance that he had an upper, less divided pinna only; lower and larger pinnæ (of the same frond) in B and H are typical. Fée's illustrations give a fair idea of the species, and I add to his descriptions some supplementary notes: I have like other authors seen pinnæ only.

Primary and secondary rachises often zigzag. Pinnæ up to 35 cm long, acuminate. Pinnulæ distant, nearly all stalked, the upper ones not decurrent, the lower often reflexed, up to 10 cm long, 2—3 cm broad, pinnatifid $^{1}/_{2}$—$^{2}/_{3}$ of the way down with somewhat arcuate, obtuse lobes $^{1}/_{2}$ cm broad; basal posterior lobe often somewhat reduced and nearly free, the anterior one very small or often quite absent (conf. Fée's tab. 98). Rachises and midribs beneath rather scaly; scales ovate or lanceolate, fimbriate, very thin bright-yellow (not unlike those of *D. deflexa*), intermixed with long and very thin woolly hairs; margins, midribs and veins above with dark-brown *Ctenitis*-hairs; surfaces otherwise glabrous, the under one finely and sparsely glandular. Veins simple or sometimes furcate, 6—8-jugate, arcuately ascending, reaching the margin, the anterior basal one ending in the leaf-tissue below the sinus. Sori a little inframedial. Indusia not found.

2. Group of D. hirta.

A well-defined group including about a dozen of species, all from Central America (Mexico—Panama) and the West-Indies. They have an erect rhizome with the leaves fasciculated; most of them are small with a lanceolate, ovate or deltoid, bipinnatifid-tripinnate lamina, others are middle-sized or, especially *D. melanosticta*, rather large, tri-quadripinnatifid. These larger species resemble not a little *D. ampla* and its allies, but they are very well characterized by their ovate lamina, i. e. the basal pinnæ are somewhat shorter than those of the next pair, at least in fully developed leaves, and by the basal lower pinnula of the basal pinna being more or less shortened, rarely equal in length to the second pinna; as a rule the middle basiscopic pinnules of the basal pinnæ are the longest, while in *D. ampla* the basal one is always the largest. — In all species, *D. strigilosa* and *D. Hemsleyana* exepted, the veins do not reach the margin. Lamina thin-leaved, rarely firm, (f. inst. *D. lanceolata*) more or less glanduloso-pubescent and scaly, always without dry, whitish hairs. Scales of costæ and costules beneath of most species bullate, those of the stipe and rachis narrow-linear, entire, hairlike, rather rigid and most often black-brown, often retrorse, and they do not form a large tuft at the base of the stipe as in *D. ampla* and its allies (see, however, *D. interjecta*). Several of the species have persistent large indusia, which in *D. nemorosa* and *D. melanosticta* are subpeltatedly fixed and orbicular; for which reason these two species have often been referred to *Polystichum*; in some of the smaller species *(D. hirta, crystallina)* the indusia are small, early deciduous, often missing.

To this group it seems natural to refer some of the bipinnatifid species dealt with in the first part of this monograph, viz. *D. strigilosa, Lindeni, Salvini, lanceolata* and *Hemsleyana*, while the two species *D. nigrovenia* and *D. Tonduzii*, although having bullate scales, seem to be so closely related to *D. falciculata* that it would be unnatural to remove them from the group of *D. submarginalis*; they connect however, that group with that of *D. hirta*.

None of the five species named above shows all the essential character of this group, as do most of the more composite species. *D. strigilosa* has the characteristic glandulose pubescence and setose scales of *D. hirta*, but it lacks bullate scales and the veins reach the margin; *D. Lindeni* and *D. Salvini* have bullate scales and the veins do not reach the margin, but their leaves are firm and not glandulose-pubescent. *D. lanceolata* is by firm, thick texture and by its ligulate segments very different from all other species here grouped together; in the said characters it resembles *D. protensa*, but its small size, lanceolate lamina, bullate scales, small erect rhizome and large indusia indicate connection with *D. Salvini*. Finally, *D. Hemsleyana* looks very peculiar by its nearly tripartite lamina with a pair of very much developed basal pinnæ, the lower side of which is very produced, while the central part of the leaf is regularly bipinnatifid. Also by its firmer texture, by its veins reaching

the margins, its apparently exindusiate sori and other characters it is a species that not easily can be consociated with others of the subgenus; still in its setose, black-brown scales of the stipe, shape of segments and other characters it closely resembles *D. chiriquiana* and *D. melanosticta*, so that its most natural position is within the present group.

It is not unlikely that also *D. vellea* (Willd.) O. Ktze., placed in the group of *D. submarginalis*, on the study of better material than I possess will prove to be a member of the present group.

In the following key I include also three of the five species mentioned above, which in the larger states are fully bipinnate below, referring to the number under which they were described in the first part of this monograph. The two species *D. Lindeni* and *D. Salvini* are bipinnatifid throughout.

Key to the Species.

1. Smaller species: lamina rarely 25 cm long often much smaller, lanceolate, ovate-lanceolate or deltoid, bipinnatifid-tripinnatifid, in *D. Hemsleyana* nearly tripartite. 2
— Larger species: lamina ovate, 25—100 cm long, tri-quadripinnatifid; basal pinnæ with their middle basiscopic pinnules somewhat produced, the basal one always more or less shortened. 8
2. Scales of costæ and costulæ beneath not bullate; veins reaching the margin. 3
— Scales of costæ and costulæ bullate; veins not reaching the margin. 5
3. Basal pinnæ not considerably enlarged or not at all; lamina ovate-lanceolate or ovate-deltoid, underside glanduloso-pubescent. 4
— Basal pinnæ much the largest: lamina being nearly tripartite; underside not glanduloso-pubescent, at best minutely glandular.
302. *D. Hemsleyana* (Bak.) C. Chr. (47)
4. Lamina lanceolate-oblong or ovate-lanceolate; lower side of basal pinnæ not produced. 301. *D. strigilosa* Dav. (43)
— Lamina ovate-deltoid or ovoid, lower side of basal pinnæ produced.
304. *D. chiriquiana* n. sp.
5. Lamina lanceolate, firm, glabrous; segments or pinnules ligulate, entire or deeply lobed with 2—3 obtuse lobes. Sori large, persistent
302. *D. lanceolata* (Bak.) O. Ktze. (46)
— Lamina oblong-lanceolate, ovate or deltoid, glanduloso-pubescent; segments not ligulate. 6
6. Lamina oblong-lanceolate, 4—6 cm broad by 10—20 cm long, very thin; pinnæ on long stalks, broadly deltoid; indusia minute 306. *D. crystallina* (Kze.) Maxon
— Lamina deltoid or ovate; pinnæ short-stalked, oblong. 7
7. Lamina broadly deltoid, about 10 cm each way, glanduloso-pubescent beneath with short appressed, cylindrical; hairs scales of midribs iridescent; indusia minute.
305. *D. hirta* (Sw.) O. Ktze.

— Lamina ovate, 20—25 cm long, 10—12 cm broad, glanduloso-pubescent beneath by erect, small glands; scales of midribs reddish brown; indusia reddish, persistent. 307. *D. oophylla* n. sp.

8. Scales of midribs of secondary pinnules beneath bullate. Indusia generally persistent. Lamina most often brownish when dried. 10
— Scales of midribs not bullate, lanceolate, dark brown. Indusia small, fugacious 9.

9. Costæ and costules beneath with soft, articulated hairs. 304. *D. chiriquiana* n. sp.
— Costæ and costules without such hairs. Lamina dark green, often with castaneous rachises. 311. *D. Grisebachii* (Bak.) O. Ktze.

10. Largest pinnæ rarely more than 10 cm long, bipinnatifid; ultimate segments entire or nearly so. Indusia often with dark red or blackish centre. 308. *D. nemorosa* (Willd.) C. Chr.
— Largest pinnæ 20—40 cm long; ultimate segments at least toothed. 11

11. Segments sharply toothed or lobed with falcate lobes. Continental species. 12
— Segments remotely toothed. Indusium concolorous. Lesser Antilles and Bermuda. 312. *D. meridionalis* (Poir.) C. Chr.

12. Scales of stipe and rachises dark brown. rather rigid, those of the pinnæ from a nearly circular base hairpointed; bullate scales numerous. Indusia persistent with a fuscous centre. 309. *D. melanosticta* (Kze.) O. Ktze.
— Scales of stipe flaccid, reddish brown, those of the pinnæ similar but smaller; bullate scales very small and few. Indusia deciduous. 310. *D. interjecta* n. sp.

304. **Dryopteris chiriquiana** n. sp.

Type from Panama, leg. Maxon nr. 5729 (W!)

Species *D. hirtae* et *D. oophyllae* proxima, differt major, minus incisa, costis costulisque subtus parcius paleaceis, paleis nec bullatis, et pilis articulatis *Ctenitidis* molliter pubescentibus; indusiis perparvis.

Rhizome thick, erect, densely clothed with castaneous, entire, lanceolate scales. Stipites fasciculated, about 20 cm long, brownish, like rachis with similar but smaller, retrorse scales and finely glanduloso-puberulous by minute, appressed, deciduous hairs. Lamina about 20 cm long, 15—20 cm broad, deltoideo-ovate, fresh green, firmly herbaceous, tripinnatifid below, bipinnate-bipinnatifid at the middle. Pinnæ about 10-jugate, basal ones opposite, short-stalked, about 10 cm long, scarcely longer than the next following, bipinnatifid at base, their lower side somewhat produced with the basal lower pinnula a little longer than the next. Middle pinnæ short-stalked or sessile, ovate-oblong, broadest at base, upcurved, acuminate, at base incised to midrib. Secondary pinnules or segments oblong, broadly adnate and decurrent, the lower ones of larger pinnæ free, obtuse or subacute, about $^1/_2$ cm broad, those of the lower half of the 2—3 pairs of lower pinnæ pinnatifid, lobed or serrated into subfalcate, acute lobes or teeth, those of the upper half of the leaf mostly

entire. Midribs of pinnæ and pinnules above rusty-pilose by *Ctenitis*-hairs, together with the veins beneath softly pubescent by longer, flaccid and paler articulated hairs; margins ciliated by similar hairs, under surface minutely glandulose; midribs of pinnæ and larger pinnulæ beneath rather sparsely furnished with small brown, lanceolate or ovate-lanceolate, not bullate scales. Veins pinnate in ultimate lobes, not quite reaching the margin; midvein of the posterior basal segment springs out from the midrib of the pinnula above its base. Sori small, about medial on the ultimate veins; indusia very fugacious, ciliate.

By its dark-coloured scales this new species agrees with *D. hirta* and related species, most resembling *D. oophylla* in size and general habit; it differs from all near relatives of *D. hirta* by the lack of bullate scales and especially by the presence of articulated, soft hairs on margins and midribs beneath. From small forms of *D. ampla* it may be distinguished at once by its dark-coloured retrorse scales of the stipes, from *D. Hemsleyana* by pubescence and less developed basal pinnæ.

Panama: Humid forests along the upper Caldera River, above El Boquete, Chiriqui, 1450—1650 meters, Maxon nr. 5729 (W, CC); and southern slope of Cerro de la Horqueta, Chiriqui, about 1700 meters, Maxon nr. 5437 (W).

Costa Rica: Vicinity of Coliblanco, 1950 m, Maxon nr. 317 a (W); Sumbres, P. Biolley fil. nr. 14395 (W); Rio Torres, Alfaro nr. 22 (W); Aserri pr. San José, Lehmann nr. 27 (RB).

forma *major*. Much larger than the accepted type; lamina ovate, 50 cm long by 20 cm broad or more, still larger than *D. nemorosa;* in minute characters it agrees perfectly with *D. chiriquiana*, and it is widely different from the larger species of this group by its soft, articulated hairs on the costæ and costules beneath, lack of bullate scales, and its small, exindusiate sori.

Costa Rica: Tablazo, C. Brade nr. 27 (RB); Wercklé (W).

305. **Dryopteris hirta** (Sw.) O. Ktze. Rev. Gen. Pl. **2:** 813. 1891; C. Chr. Ind. 270.

Syn. *Polypodium hirtum* Sw. Prodr. Fl. Ind. occ. 133. 1788, Fl. Ind. occ. **3:** 1686.
Aspidium hirtum Sw. 1801; Mett. Aspid. nr. 271 (excl. var.); Schkuhr, Kr. Gen. t. 46 b. Lowe, Ferns **7** t. 11.
Cystopteris hirta Kl. Linnaea **20:** 361. 1847!
Polypodium barbatum Kze.; Spr. Syst. **4:** 57. 1827; Kze. Linnaea **9:** 52. 1834!
Cystopteris rufescens Fée, Gen. 300. 1850—52; 6. mém. 22 tab. 6 fig. 2.

Type from Jamaica, leg. Swartz (S! H, B).

Hooker (sp. 4: 128) and Baker (Syn. 278) united under *Nephrodium hirtum* a series of forms, which naturally must be referred to four species, viz. *D. hirta*, *D. oophylla*, *D. crystallina* and *D. nemorosa*. The genuine *D. hirta*, the form collected and described by Swartz shows the following characters:

Lamina distinctly deltoid in outline, seldom more than 10 cm long and wide, often smaller, on a stalk of equal length, thinly herbaceous flaccid, tripinnatifid, tripinnate below. Pinnæ at distances of 2—3 cm, the basal ones the largest, unequally

deltoid with their basiscopic pinnules, especially the basal one, produced; middle and upper pinnæ oblong. Secondary pinnules of middle pinnæ adnate, the upper ones decurrent at base, obtuse, with 4—5 obtuse-oblique, lobes on each side. The whole leaf throughout glanduloso-pubescent by short thick cylindrical, appressed hairs, consisting of a single cell. Scales of stipes, rachis and stalks of pinnæ narrow-linear, dark-brown, those of the midribs of pinnæ beneath in typical forms bullate with a short, suddenly contracted apex, somewhat iridescent; similar scales are found on the midribs of the secondary pinnules beneath, but they are always few in number, sometimes absent. Ultimate veins do not reach the margins. Indusia small, reddish, early deciduous, glandulose by short hairs as is the whole underside of the lamina. Spores echinate.

The form here described is found at lower elevations in Jamaica, and with it agrees closely that form from Eastern Cuba, which FÉE described and figured as *Cystopteris rufescens;* it has sometimes a more ovate-deltoid or even ovate-oblong leaf and its bullate scales are less iridescent. Other forms or varieties occur in Western Cuba, San Domingo and Porto Rico, and a very distinct subspecies or better a related species is found at higher elevations in Jamaica. I describe these different forms below. — HOOKER referred to his *Nephrodium hirtum* a plant from West Tropical Africa, leg. CURROR. I have not seen it and can form no opinion of it; still I think it is different from *D. hirta.*

1. forma *genuina* (incl. *Cystopteris rufescens*). Scales of midribs of pinnæ bullate, somewhat iridescent; indusia small, reddish.

Jamaica: Near Priestmann's River, MAXON nr. 2498 (CC, H, Rg, W): Kempshot and Ocho-Rios, ELIZ. G. BRITTON. nr. 687, 745 (W); **Vinegar Hills**, DAVID WATT nr. 147 (R, RB).
Cuba: **Oriente**, Monte Verde, WRIGHT nr. 1016 (B, S, W); **ad Jaguey**, EGGERS nr. 4926 b (B).
Porto Rico: Finca Alvarez, HIORAM, ed. Rosenst. Fil. portoric. exs. nr. 18 (R, RB).

2. forma *cubana* (*Pol. barbatum* Kze.). Scales of midribs of pinnæ subbullate or scarcely so, beautifully iridescent; indusia minute, rarely seen, pale or whitish. Leaf often less glandular. A form of the Western provinces of Cuba.

Cuba ad Embarcadero del lanimar, POEPPIC (B, RB, type of *P. barbatum* Kze.); **Via Tumbadero**, OTTO nr. 91 (B = *Cystopteris hirta* Kl.). **Pinar del Rio**: Lomas de Guanajay, v. HERMANN nr. 2183 (W); **Sierra de Anafe**, WILSON nr. 11580 (W); LÉON s. n. (RB); **Loma del Carmen**, LÉON nr. 442 (W); **sine loco**, EKMAN nr. 1132 (CC). **Prov. Habana**: San Antonio de los Banos, v. HERMANN nr. 3349 (W). **Prov. Santa Clara**: Patajones to Ciegos de Ponciano, SHAFER nr. 12246 (W). **Prov. Habana**: Loma de la Jaula, LÉON nr. 3518 (RB).

3. f. *domingana.* — Scales of midribs of pinnæ not bullate, ovate-acuminate, larger than in the other forms, iridescent; indusia minute. Lamina less glanduloso-pubescent, especially above.

Sto. Domingo prope Puerto Plata, Isabel de la torre, EGGERS nr. 1585, 2762 b (B). 1575 pt. (W, not others).

4. f. *portoricana.* — Scales of midribs of pinnæ not bullate, from a somewhat broader base linear-acuminate, scarcely iridescent, dark-brown; indusia minute. Lamina rather glandular, often larger than other forms.

Porto Rico, Sintenis nr. 6251, 6400 b (B), 5454 (RB, W, not B), 6325 pt., 5947 (B), Gundlach 1398 (B). Most of these specimens are a mixture of *D. hirta* and *D. nemorosa*. — Underwood and Griggs nr. 815 (W): Hioram nr. 168 (W); Eliz. G. Britton and Della W. Marble nr. 801 (W).

305. **Dryopteris crystallina** (Kunze) Maxon in C. Chr. Ind. 259. 1905.

Syn. *Polypodium crystallinum* Kunze, Farrnkr. **2**: 85 tab. 135. 1851.
Cystopteris brevinervis Fée, Gen. 300, 1850—52; 7. mém. 65 tab. 26 fig. 2. 1857.
Aspidium hirtum var. Mett. Aspid. 114. 1858, et auctt.

Type from Cuba, leg. Linden nr. 1876 (cotype in RB!).

A beautiful series of specimens of this little fern gathered in recent time prove that it must be considered a valid species, different from *D. hirta* by its habit. — The very thin lamina is oblong, rarely ovate-oblong in outline, 10—20 cm long, 4—6 cm broad, tripinnatifid or tripinnate below. Pinnæ remote, the lower ones at distances of up to 5 cm, long-stalked, all but the uppermost ones deltoid, obtuse. Lower secondary pinnules deltoid, tertiary segments ovate, broadly obtuse, 2—4 mm long and broad. In minute characters the species scarcely differs from the Cuban form of *D. hirta*. Scales of the midribs of the pinnæ beneath ovate-acuminate iridescent, those of the midribs of secondary pinnæ bullate, iridescent, few. Ultimate veins not nearly reaching the edge. Sori small; indusia very minute, fugacious, not always found.

Cuba: Oriente, Mt. Libano, Linden nr. 1876 (RB) and Maxon nr. 4241 (W, RB); Wright nr. 1015 (B, S, W); Loma del Jaguey, Eggers nr. 4926 (B, RB, W): near Jaguey, Yateras, Maxon nr. 4107, 4151 (W); Finca Las Gracias, Maxon nr. 4488 (W); El Yunque, Mt. Baracoa, Underwood and Earle nr. 961 (RB, H, W); La Perla, Shafer nr. 8504 (W), 8891 (B, W).

Jamaica: Below John Crow Peak, W. Harris nr. 7335 (B) — a somewhat doubtful form, it may be a juvenile *D. hirta*.

307. **Dryopteris oophylla** n. sp.

Type from Jamaica leg. Maxon nr. 1931 (CC. also W, RB, Rg).

Closely related to *D. hirta*, with which species it was hitherto confounded; by Jenman (Bull. Dept. Jam. n. s. **3**: 94) it was considered a large state of *D. hirta*. I am convinced, however, that it is a fixed species, at least, if one prefers, a subspecies of *D. hirta*. It differs from that species by the following characters:

Leaf larger, up to 20—25 cm high on a stipe 20—30 cm long, ovate, not deltoid, 10—12 cm broad at base, erect, rather firm tripinnate-tripinnatifid. Basal pinnæ with the lower side somewhat produced. Secondary pinnulæ of middle pinnæ generally less deeply cut than those of *D. hirta*, although they are larger, their lobes,

5—6 to each side, close, not so oblique as in *D. hirta*. Upper surface rather densely pubescent by appressed, cylindrical, short, pale hairs, underside glandular by ovate or globose, erect glands, cylindrical hairs generally absent. Scales of midribs of pinnæ beneath subbullate with a broad, reddish-brown base and a rather long, narrow apex, which is darker along the middle, not metallic; scales of midribs of secondary pinnules rather many, red-brown, not metallic, with a broad bullate, very inflated base and a short, concolorous apex. Indusia persistent, rather large, red-brown, glandular.

Other smaller differences between *D. hirta* and *D. oophylla* may be found, but the said characters: shape and size of lamina, colour of scales, different glands beneath and the persistent sori, seem sufficient to distinguish our new species from *D. hirta*. It seems to be endemic in Jamaica, where it inhabits higher elevations.

Jamaica: Vicinity of Hollymount, Mt. Diabolo, Maxon nr. 1931 (CC, Rg, RB, W), 1941 (W), 2268 (H, Rg, RB, W); Underwood nr. 3457 (W); Vicinity of Moody's Gap, Maxon nr. 1047 (W = Underwood nr. 2167).

308. **Dryopteris nemorosa** (Willd.) Urban, Symb. Ant. 4: 15. 1903.
C. Chr. Ind. 279. — Fig. 6.

Syn. *Aspidium nemorosum* Willd. sp. 5: 255. 1810.
Nephrodium nemorosum Desv. 1827 (non Jenm. 1908).
Aspidium lepidotrichum Desv. Berl. Mag. 5: 321. 1811.
Nephrodium myriolepis Bak. Journ. of Bot. 1888: 34 (Eggers 1575!).
Dryopteris myriolepis C. Chr. Ind. 279. 1905.
Type from Sto. Domingo, based on Plumier's Tab. 43.

Plumier's plate very well illustrates this species, which by several authors has been confounded with *D. hirta*, although it is not nearly related to that species. It is interesting to note, how authors have misunderstood the present species. Thus Hooker and Baker (sp. and syn.) united it with *D. hirta*, and later on Baker described it as a new species: *N. myriolepis;* the very slightly different form *Aspidium melanochlamys* Fée was, on the other hand, adopted as a distinct species and placed under the subgenus *Polystichum!*

Lamina 30—40 cm long, 20 cm, broad, ovate in outline, on a proportionally short stipe (15—20 cm long), herbaceous, of a brownish colour when dry, tripinnatifid, scarcely tripinnate below. Pinnæ generally subopposite, ovate-oblong, the basal ones a little shorter than the second pair, their lower side not or very slightly produced, and their lower basal pinnula always shorter than the next. Secondary pinnules close, decurrent, 8—10 mm broad, shortly acute, incised nearly to the midrib into about 10 pairs of close, oblique, obliquely acute, entire or rarely faintly toothed, oblong lobes, about 2 mm broad. Midveins of the posterior basal, decurrent lobe often springs out from the midrib of the pinna. Veins of lobes distant, oblique, about 3-jugate, not reaching the margin. Sori often one to each lobe on the basal

anterior vein, but also 2—5. Indusia large, persistent, circular, rotundato-reniform, glabrous, reddish-brown or dark-brown and impressed at the centre. — Stipes and rachis rather densely crinite by similar narrow, dark-brown scales as in *D. hirta*. Surfaces of the typical form not glandulose, along the midribs of both side, most densely above, with common *Ctenitis*-hairs, beneath with a fair number of red-brown, not iridescent scales, which from a bullate base are rather suddenly contracted into a long hairlike apex.

The typical form of this distinct species occurs in Sto. Domingo and Porto Rico; some of the specimens from the latter island differ by having a slightly glandular underside and nearly black-centred indusia. Such specimens could as well be referred to var. *melanochlamys*. — *Aspidium setigerum* Sw. Adnot. 66. 1829, from Sto. Domingo, l. Poiteau, is according to the description probably this species.

Sto. Domingo: prope Puerto Plata, Loma Isabel de la torre, Eggers nr. 1575 (B, CC, H, Kew), 2762, 2762 c (B) — Prov. Barahona, Mt. Noche buena, Fuertes nr. 1043 (W).

Porto Rico, Sintenis nr. 5454 (B pt., not RB), 5885 (B, CC, S), 5947 (B, RB), 6111 (B, W), 6325 (B); Gundlach nr. 1396 (B); Hioram nr. 167 (R, W), 500 (R); Underwood and Griggs nr. 818 (W).

? Guadeloupe, L'Herminier nr. 20 pt. (B). — Locality perhaps false.

? Grenada, Sherring, t. Bak. Ann. of Bot. **6**: 99. 1892 with description; Baker identified the specimens with Sintenis nr. 5885, still it is probable that it really belongs to *D. meridionalis*.

Fig. 6. *D. nemorosa* (Willd.) Urb. Basal pinna, nat. size, and segments, × 2.

var. **melanochlamys** (Fée)

Syn. *Aspidium melanochlamys* Fée, Gen. 294. 1850—52; Hook. sp. **4**: 35 t. 233 A.
Polystichum melanochlamys Diels 1899; C. Chr. Ind. 584.
Dryopteris melanochlamys O. Ktze. 1891; C. Chr. Ind. Suppl. 108.
Aspidium lomatopelta Kze.; Mett. Aspid. 72. 1858.
Dryopteris lomatopelta C. Chr. Ind. 275. 1905.

Differs from the type mainly by its glandular under surface, coal-black, glandulose indusia with brown edges, more numerous scales and more distant and

narrower secondary pinnulæ which are 5—6 mm broad, often somewhat contracted towards base, less deeply incised with shorter, not so close, mostly unisorous lobes Otherwise it agrees with the type, with which it is connected by some specimens from Porto Rico.

Cuba; Oriente: Mt. Libano, Linden nr. 1865 (Kew, RB, type-number); Maxon, nr. 4251 (W); Monte Verde, Wright nr. 830 (CC, B, S, W); Josephina, north of Jaguey, Maxon nr. 4109 (RB. W): La Perla, Shafer nr. 8519 (W).

309. **Dryopteris melanosticta** (Kunze) O. Ktze. Rev. Gen. Pl. **2**: 813. 1891. C. Chr. Ind. Suppl. 108.

Syn. *Aspidium melanostictum* Kunze, Linnæa **13**: 148. 1839; Hook. sp. **4**: 34 pl. 233 B; Mett. Aspid. 73.

Polystichum melanostictum Liebm. Vid. Selsk. Skr. V. **1**: 276 (seors. 124)! C. Chr. Ind. 584.

Lastrea Schiedeana Pr. Tent. 76. 1836 (nomen).

Aspidium extensum Fée, Gen, 294. 1850—52

Aspidium expansum Fée, 10. mém. 42. 1865.

Aspidium Trianae Fourn. Mex. pl. **1**: 98. 1872, pro parte?

Type from Mexico ad Cuesta grande ad Chicanquiaco, leg. Schiede nr. 765 (cotype in B!)

The present species, common in Southern Mexico and Guatemala, is very closely related to *D. nemorosa;* as a fact smaller forms of it might very naturally be referred to *D. nemorosa* as a variety. A long series of specimens at hand show, however, that these small forms are smaller plants of a species that grows much larger, and in its fully developed state it is considerably different from *D. nemorosa.* The original *A. melanostictum* Kze. is the smaller form, while the larger is *A. extensum* Fée, a name invalidated by *A. extensum* Bl. 1828 and by Fée himself altered into *A. expansum.* Fournier referred the large form to *A. Trianae* Mett., a totally different species, and he considered it diffent from *A. melanostictum* Kze. I cannot at all agree in this, cannot even distinguish the two forms as varieties.

As to almost all characters *D. melanosticta* agrees with *D. nemorosa*: shape of lamina and pinnæ with adnate, decurrent pinnulæ (by these characters different from *D. ampla* and its allies), persistent rotundato-reniform indusia and bullate scales. Constant differences seem to be: lamina more broadly ovate, even in small leaves some of the larger tertiary segments are distinctly toothed, in *D. nemorosa* always entire, and fewer scales along the midribs beneath. Scales, at least those of the midribs of tertiary segments, distinctly bullate, dull brown, those of the midribs of pinnæ of larger leaves from a nearly circular, bright-brown, scarcely bullate base suddenly contracted into a long, darker apex. Indusia large, persistent, rotundato-reniform, glanduloso-ciliate, deep red-brown with bright-brown edges; still the colour of the indusia is variable; in some larger specimens it is nearly concolorous with a black spot at centre. From *D. meridionalis* our species differs by colour of indusium and more close segments and lobes.

As mentioned *D. melanosticta* varies considerably in size, and also in colour, but I am firmly convinced that this variation is due to different growing-places only. Smaller plants, which apparently have grown in open places, have generally bright-green leaves (yellowish-green when dried) that are 30—50 cm long, largest pinnæ 15—20 cm long, 6—7 cm broad, tripinnatifid, rarely tripinnate below; most tertiary segments entire, 5—6 mm long, 2 mm broad. Larger plants from shaded localities are generally dark-green (blackish-green when dried), lamina 60—80 cm long, largest pinnæ 25 cm long, 10—12 cm broad, tripinnate-quadripinnatifid; tertiary segments 10—15 cm long, 3—4 mm broad, sharply and obliquely toothed or lobed. Between these two extremes one finds all possible intermediates. — Below I enumerate only a part of the numerous specimens seen.

Mexico: Vera Cruz, Cordoba, H. Fink nr. 43, 56, 64, 131, 152 (W), 126, 152 (B); Galeotti nr. 6320 (Kew); Bourgeau nr. 1790 (H, RB), 1838 (H), 2011 (B, W); Mirador, Liebmann (B, H, RB, S, U), Colipa and Misantla, Liebmann (H); Jacuapan, Purpus nr. 1980 (W), 2838 a (B), Oajaca: Jacotepec, Chinantla, Liebmann (H). — San Luis Potosi: barranca of Las Canoas, Pringle nr. 3825 (B, RB, S, W): — Schaffner s. n. (B), Chiapas: Ruinas de Palenque, C. et E. Seler nr. 5494 (B, W); S. Cristobal, G. Munch nr. 18 (RB).

Guatemala. Dept. Alta Verapaz, Cubilquitz, v. Türckheim ed. J. D. S, nr. 8050 (B, W), 8628 (B, W), 8641 (W), 8642 (R) (distributed as *Nephrodium amplum* Bak., nr. 8050 as *N. villosum* Bak.); Senahú, Donnell Smith nr. 1562 (W); near the Finca Sepacuite, Cook et Griggs nr. 502 (W); near Cacao, H. S. Barber nr. 196 (W). — Dept. Sololá, Santa Barbara, W. C. Shannon ed. J. D. S. nr. 249 (W).

Some of the specimens from Guatemala come very near to

var. **bullata** (Christ).

Syn. *Aspidium bullatum* Christ, Bull. l'Herb. Boiss. II. **6**: 53. 1906.

Dryopteris bullata C. Chr. Ind. Fil. Suppl. 30. 1913.

Differs mainly by its concolorous, bright-brown indusia, rather glandular under surface and numerous larger bullate scales along the midribs of tertiary pinnulæ beneath.

Costa Rica: ad rio Navarro, Wercklé nr. 16766 (CC, RB, W); Maxon nr. 624 (W); Guadeloupe, Alfaro nr. 16579 (R).

310. **Dryopteris interjecta** sp. nov.

Type from Guatemala, leg. H. v. Türckheim ed. Donn. Smith nr. 8049 (W), Species critica, medium inter *D. melanostictam* et *D. amplam* tenens, squamis basalibus rachiumque iis *D. amplae* similibus, configuratione laminae ac pinnarum basalium cum *D. melanosticta* congruens.

Stipitibus fuscis, ad 80 cm longis, squamis anguste lanceolatis, adpressis, tenuibus, pallide brunneis subdense onustis, ad basin squamis numerosis, linearibus, flexiblibus more *D. amplae* circumdatis. Lamina metrum longa, ovata, firmiter herbacea, in siccitate atroviridi, tripinnatifida. Pinnis suboppositis, ad 12 cm inter se distantibus, basalibus iis paris sequentis subaequilongis, ad 40 cm longis, stipitatis acuminatis, e medio latiore versus basin paulo attenuatis. Pinnulis 1—2 cm inter se distantibus, majoribus sessilibus vel breviter petiolatis, medialibus adnatis, supe-

rioribus longe decurrentibus, iis pinnarum medialium 5—6 cm longis. $1^1/_4$—$1^1/_2$ cm latis, acuminatis, fere ad costam pinnatifidis. Segmentis tertiariis 10—12-jugis, obliquis, sinubus latis separatis, acutis, 3—4 mm latis, majoribus lobatis, minoribus serratis subintegrisve; lobis vel dentibus falcatis. Rachi rachillisque subtus squamis maxime antrorsis linearibus, piliformibus, pallide brunneis vel rufescentibus sparse vestitis. Pagina superiore praeter costas costulasque pilis articulatis *Ctenitidis* crispato-hirtas glabra, inferiore inconspicue glanduloso-pubescente vel glabra, ad costas pinnularum squamis perparvis bullatis sparsissime instructa. Venis in lobis ultimis furcatis, in dentibus simplicibus, fere marginem attingentibus. Soris majusculis, globosis, maturis fere contiguis. Indusiis in speciminibus fere omnibus delapsis, rotundato-reniformibus concoloribus (?) pilis cylindricis ciliatis.

This new species is closely related to *D. melanosticta*, agreeing with it in shape of lamina and basal pinnæ, it differs by its scales of stipe and rachises, which are bright reddish-brown, very narrow, hairlike and flaccid, often intertangled; the basal scales form a rather large tuft as in *D. ampla* and they are similarly soft and wool-like. The distant secondary and tertiary pinnulæ give the leaf a habit rather different from that of *D. melanosticta*, and the upper pinnules are longer decurrent. Bullate scales may be found on the midribs of the pinnules, but they are very few and small. The lamina is much less glandular beneath than most forms of *D. melanosticta*.

Guatemala, Dept. Alta Verapaz, Cubilquitz, 350 m, v. Türckheim ed. J. D. S. nr. 8049 (B, RB, W); without locality, Warscewicz (B).

Honduras, Dept. Santa Barbara, San Pedro Sula, C. Thieme ed. J. D. S. nr. 5672 (RB, W).

311. **Dryopteris Grisebachii** (Baker) O. Ktze. Rev. Gew. Pl. **2**: 812. 1891. Fig. 7.

Syn. *Nephrodium Grisebachii* Bak. Syn. 285. 1867; Jenman, Bull. Bot. Dept. Jamaica n. s. **3**: 113; W. Ind. and Guiana Ferus 220.

Nephrodium amplum Hook. sp. **4**: 264. 1862 (not Mett. 1858).

Dryopteris ameristoneura C. Chr. Ind. 251. 1905, probably not *Aspidium ameristonevron* Fée, 8. mém. 104. 1857.

Type from Cuba, leg. Wright nr. 1055 (Kew!).

In Index Filicum I have followed Kuhn in identifying *N. Grisebachii* Bak. with *A. ameristonevron* Fée, now I have my serious doubts as to this being well founded. Fée's description does not agree very well with *N. Grisebachii;* the segments are described as »ovoïdes« and the leaf as having a »teinte générale brunâtre«; this last character, although rather unreliable, fits *D. ampla*, not *D. Grisebachii*. Fée quotes no collector but the locality »Cuba« only; probably he has here committed an error. On a label in Herb. Mett. (B) Mettenius has written: »Aspidium ameristoneuron Fée ined. Mexico. Tabasco. 1489. Jurgensen. I have no doubt that Mettenius' note is right, that the species of Fée is really Mexican; from Mexico I do not know any form that with certainly may be referred to *D. Grisebachii*.

D. Grisebachii is intermediate between *D. meridionalis* and *D. ampla*. In size,

shape of middle pinnæ and of pinnulæ and segments it scarcely differs from *D. ampla*, in shape of basal pinnæ, dark-coloured scales and venation it comes near to *D. meridionalis;* from both it differs by its dark-coloured stipe and rachises and vivid-green lamina.

Rhizome decumbent, stout, densely clothed with large, glossy, castaneous, entire, lanceolate-acuminate scales. Stipes 50 cm or longer, like main-rachis glossy, castaneous (rarely fusco-stramineous), glanduloso-puberulous by appressed, very short, cylindrical hairs, pale with age and deciduous, and furnished with deciduous scales, similar to those of the rachis and becoming smaller upwards. Lamina deltoid or deltoid-ovate, up to 1 m high and nearly as wide, herbaceous, vivid green, tripinnatifid at middle, tripinnate-quadripinnatifid, sometimes quadripinnate at base. Pinnæ at distances of 8—10 cm, subopposite, on rather long stalks (those of larger pinnæ 3—4 cm long), basal ones rather the largest, often more than 40 cm long, their lower side slightly produced and their basal, basiscopic pinnula about equal in length to the next, sometimes a little longer but also shorter. Middle pinnæ nearly of same width throughout below the acuminate apex. Secondary pinnules at distances of about 2 cm, oblong-acuminate, about 6 cm long, 2—2½ cm broad, those of the lower half of the pinnæ short-stalked, the upper broadly adnate at the posterior base, the uppermost decurrent and confluent, larger ones fully pinnate at base, most of them incised nearly to the midrib into about 10 pairs of close, suboblique, subacute or obtuse, oblong lobes, 1—1½ cm long, 4 mm broad, with serrate margins. — Midribs of pinnæ castaneous, glanduloso-puberulous and beneath sparsely paleaceous like the rachis. Both surfaces with scattered, appressed, very short, cylindrical hairs, the midribs and larger veins above rusty-puberulous by articulated *Ctenitis*-hairs, beneath with rather few small, brown lanceolate or ovate-lanceolate scales. Veins of tertiary segments pinnate; ultimate veins terminating short within the margin, generally simple; midvein of the basal anterior tertiary segment of an upper secondary pinnule, which is broadly adnate to the midrib of the pinna, springs always from the midrib of the secondary pinnula, a little above its base (compare *D. meridionalis*). Sori small, medial on the veins generally confined to the lower two-thirds of the pinnæ. Indusia small, pale, very thin and fugacious. Spores echinate.

Fig. 7. *D. Grisebachii* (Bak.) O. Ktze. Secondary pinnula, nat. size, segments × 2.

Cuba orient. Wright nr. 1055 (B, W, S).

Jamaica, Jenman (B, W) Hart nr. 115 c (W); lower slopes of Mt. Moses, Maxon nr. 1067 (W), Clyde Stream and Dollwood D. Watt nr. 62, 157 (RB), near Cinchona, G. L. Fischer (R, RB).

312. **Dryopteris meridionalis** (Poiret) C. Chr. comb. nov. — Fig. 8.

Syn. *Polypodium meridionale* Poiret, Enc. **5**: 553. 1804.
Aspidium frondosum Wikstr. Vet. Ak. Handl. **1825**: 437. 1826!
Aspidium nemorosum Jenm. Gard. Chr. Febr. 3. 1894!
Nephrodium nemorosum Jenm. W. Ind. and Guiana Ferns 223. 1908 (non Desv.).
Aspidium consobrinum Fée, 11. mém. 85. 1866, t. descr.

Type from Guadeloupe, leg. Badier (Herb. Lamarck!); also in Herb. Willd. nr. 19807 (B).

Rhizome stout, erect, the crown densely clothed with linear-acuminate reddish-brown or blackish-brown scales. Stipes strong, 30 cm or more long, at base with many, upwards with rachis gradually fewer, long hair-pointed brown scales. Lamina firmly herbaceous, brownish when dry, broadly ovate, 50—75 cm long and nearly as broad, tripinnatifid or subtripinnate. Pinnæ often opposite, of larger leaves at distances of up to 10 cm, lanceolate, 20—30 cm long, 8—10 cm broad, stalked, acuminate, the basal ones a little shorter than the next pair with their middle basiscopic pinnulæ a little produced, while the basal basiscopic pinnula is shorter than the following. Secondary pinnules subopposite, at distances of about 2 cm, lanceolate, 4—6 cm long, $1^1/_4$—$1^3/_4$ cm broad, acute, the upper ones decurrent, the middle and lower ones adnate at the posterior base, the lowermost ones of lower pinnæ quite free, all incised nearly to the midrib. Tertiary segments oblique, 6—10 mm long, 3 mm broad, subacute, decurrent, the lower basal one broadly adnate to the midrib of the pinna, from which its midrib often springs out, all deeply and obliquely dentate with 3—4 teeth or lobes to each side. Veins pinnate in tertiary segments, distant, oblique, not reaching the margin, often forked in ultimate lobes. Sori 6—8 to a tertiary segment. Indusia rather thin, reddish, deciduous. Spores echinate. — Midribs of pinnæ and pinnulæ above with many *Ctenitis*-hairs, beneath with several ovate-acuminate, reddish scales, those of the tertiary segments subbullate, tertiary midribs and veins with some few small, glandular hairs; leaf-tissue of both sides glabrous or sometimes slightly glandular beneath.

Fig. 8. *D. meridionalis* (Poir.) C. Chr., Secondary pinnules, nat. size; segment × 2.

I have given a detailed description of this most distinct species, because it has been greatly misunderstood, by authors referred to *D. ampla* or to *D. funesta*,

and JENMAN believed it to be *D. nemorosa*. A comparison of my descriptions of it and *D. nemorosa* will show that the two species are closely related, agreeing with each other in most characters. *D. meridionalis* differs from *D. nemorosa* chiefly by its much larger leaf with more remote secondary pinnules, which are deeply toothed or loobed, by its weaker indusium and fewer and less bullate scales of the midribs. From *D. ampla* and *D. exelsa* it differs greatly by several characters: shape of lamina and scales, no large tuft of basal scales, adnate secondary pinnules, etc.

Guadeloupe, Herb. Willd. nr. 19807 (B); FORSSTRÖM (S = *A. frondosum* Wikstr.), L'HERMINIER (B), DUCHASSAING (B), MAZÉ (Kew).

Martinique, HAHN nr. 63 (CC, S).

St. Kitts, BERKELEY (W) — Montserrat, BUCH (B)

Dutch W. Indies, SURINGAR 1885 nr. 6174 (or 6194? U).

? Grenada, SHERRING?, see note under *D. nemorosa*.

var. **speluncae** var. nov.

Smaller than the type, secondary pinnulæ closer, tertiary segments entire or the lower ones only toothed. Upper surface often with cylindrical glandular hairs as in *D. hirta*, underside finely glandulose. Scales of midribs more numerous, often somewhat iridescent.

A characteristic fern of the caves of Bermuda, rather variable in pubescence and size; some specimens come very near to *D. nemorosa* in habit, others are scarcely to be distinguished from true *D. meridionalis*, with which it, as a whole, agrees in almost all characters. — I have chosen the varietal name *speluncæ* because it is an appropriate one, not because I consider it to be *Polypodium speluncæ L.*, which is a Ceylonese fern. In a small paper*) I have proved that PLUKENET's pl. 244 fig. 2, which gives a bad figure of the present fern cannot be taken for the type of *Pol. speluncæ L.* Most authors have referred the variety to *D. ampla*.

Bermuda, frequently collected, f. inst. by BROWN and BRITTON nr. 266, BROWN nr. 564, M. A. HOWE, B. D. GILBERT (all W), FARLOW (S); REIN nr. 89 (B).

3. Group of **D. ampla**.

A small group comprising half a dozen species of middle-size or rather large with the deltoid, decompound leaves fasciculated in a crown on the erect, sometimes subarborescent rhizome or trunk. The leaves are more or less scaly on stipe, rachises and larger midribs beneath, and the top of the rhizome and the bases of the stipes are clothed with a large and dense mass of long, thin, intertangled scales.

*) Polypodium speluncae L. A question of nomenclature. — Amer. Fern Journ. **3**: 1—4. 1913. See also Arkiv för Bot. 9^{11} pag. 6.

Surfaces often glandular and the costæ and costules above rusty-pubescent by short articulated *Ctenitis*-hairs, while common dry whitish hairs or downs are always absent. By this character the species of the *hirta*- and *ampla*-group agree but the scales of the latter species are thinner, not blackish, hairlike and those of the costules beneath never bullate. In shape of lamina the two groups differs distinctly. *D. ampla* and its allies have a deltoid or deltoid-ovate lamina, i. e. the largest pinnæ are always the basal ones, which have their lower side much produced with the basal pinnula much the largest. — From the species of the next group *(subincisae)* *D. ampla* differs by the abscence of longer subulate hairs on the costules above and by its venation. The midrib of a posterior basal ultimate segment runs out from the costula at its very base or above it, not from the costa as in *D. subincisa*. It is in general not difficult to distinguish a specimen of *D. ampla* or its allies from one of the *subincisa*-group, not only by the differences mentioned, but also by the general aspect of the leaf (colour, thin texture, shape), and the two groups represents each a separate line of development and are certainly not closely related. Still there are, of course I dare say, intermediate forms. Such is especially *D adenopteris* which by its whole habit, texture and colour seems to be closely related to *D. ampla*. Nevertheless I refer it to the next group; certainly it has its nearest relatives there.

All the species referred to the *ampla*-group are decompound. It is possible that certain bipinnatifid species placed in the group of *D. submarginalis* should be grouped together with *D. ampla*, f. inst. those species with a large tuft of basal scales (*D. submarginalis* and others), but none of these species show any tendency to a bipinnate-decompound state, which might more definitely lead to a righter understanding of their relation to *D. ampla*.

No species of this group is known from South Brazil; all the known species are Andine-West-Indian. They are closely related and their right delimitation is very difficult. My treatment is scarcely quite satisfactory; it is probable that several pteridologists would prefer to unite into a single species *D. ampla*, *D. excelsa* and *D. equestris*, others have descibed a number of »species« which I unite with *D. ampla*. I am inclined to believe that my *D. ampla* includes several »geographical species«, but very comprehensive collections of perfect specimens are needed for a delimitation of such species.

Key to the Species.

1. Scales of the axils of pinnæ bright-brown or reddish brown, slightly fimbriate or entire. 2
— Scales of the axils brown or nearly black, often glossy. 5

2. Scales of the axils ovate, consisting of isodiametrical cells. Lamina not ciliate. 314. *D. excelsa* (Desv.) C. Chr.
— Scales of the axils lanceolate consisting of rectangular cells. Lamina ciliate. 3
3. Lamina finely downy throughout; scales few. (The species referred to the group of *D. subincisa*). 342. *D. adenopteris* n. sp.
— Lamina not downy; scales many. 4
4. Lamina as a rule yellowish when dried; basal scales bright brown; surfaces generally densely glandular. Pinnules acuminate, ultimate lobes not or slightly falcate. Indusia very fugacious, pale, hyaline. 313. *D. ampla* (H. B. W.) O. Ktze.
— Lamina brown when dried; basal scales reddish brown; surfaces slightly glandular or not. Pinnules shortly acute or obtuse, ultimate lobes generally distinctly falcate, close. Indusia subpersistent, reddish. 317. *D. nemophila* (Kze.) C. Chr.
5. Lamina throughout densely glandular. 6
— Lamina slightly glandular or not. 315. *D. equestris* (Kze.) C. Chr.
6. Indusia subpersistent, reddish. 316. *D. palatangana* (Hook.) C. Chr.
— Indusia very fugacious 313. *D, ampla* var. *subdryopteris* (Christ)

313. **Dryopteris ampla** (H. B. Willd.) O. Ktze. Rev. Gen. Pl. **2:** 812. 1891; C. Chr. Ind. 251. — Fig. 9.

Syn. *Polypodium amplum* Humb. & Bonpl.; Willd. sp. **5:** 207. 1810.
Aspidium amplum Mett. Aspid. 74 nr. 176. 1858 (excl. var.); Lowe, Ferns **2** tab. 52.
Nephrodium amplum Bak. Syn. 285. 1857; Jenman, Bull. Dept. Jam. n. s. **3:** 113. 1896; W. Ind. and Guiana Ferns 221.
Polypodium Sloanei Poeppig; Spr. Syst. **4:** 59. 1827; Kze. Linnaea **9**: 51. 1834! (Sloane, Jam. t. 57 f. 3).
Polypodium lachnopodium J. Sm. Bot. Mag. **72:** Comp. 8. 1846!
Polypodium paleaceum Hook. fil. Trans. Linn. Soc. **20:** 166. 1847; Andersson, Vet. Akad. Handl. **1853:** 126, 1855!; Hook. sp. **4:** 261.
Dryopteris furcata C. Chr. Ind. 267 (the var.); A. Stewart, Proceed. Californian Acad. Sci. IV. **1:** 18. 1911.
Aspidium culcita Christ, Bull. L'Herb. Boiss. II. **6:** 54. 1906!
Dryopteris culcita C. Chr. Ind. Suppl. 31. 1913.
Polypodium prasinum Christ, Bull. Soc. bot. Belg. **35:** 217. 1896 (not Baker).

Type from Venezuela, leg. HUMBOLDT (Herb. Willd. nr. 19722, B!).

Here I follow METTENIUS in identifying *Pol. Sloanei* Poep. with *P. amplum* Willd, although I have some doubt of that being right. The type-specimen of *P. amplum* consists of 2 pairs of pinnæ from the middle of a frond, and it is true that in most characters it agrees very well with pinnæ of similar size of *P. Sloanei*, which is represented by several sheets from the type-collection in B and RB, and which perfectly matches several other specimens from different countries, but in some other

characters the type-specimen is scarcely to be distinguished from the form that authors have identified with *Aspidium catocarpum* Kze., which I refer to *D. nemophila* (Kze.) C. Chr. It is, therefore, an open question, whether *P. amplum* is the same as *P. Sloanei* Poep. or *A. catocarpum* Kz.; there remains the possibility that *P. amplum* is a species intermediate between the two others, but my material at hand, although rather comprehensive, is insufficient for solving that question. A series of perfect specimens from the Andes of Venezuela may show, I think, what is right.

D. ampla is, as interpreted here, the »central« species of a number of closely related species, the right understanding of which is difficult, especially when one has to work with fragmentary specimens, which is generally the case with species of that size. What is called *D. ampla* in the literature or in herbaria is often widely different things; the generally large bundles of so-called *D. ampla* in most herbaria contain specimens belonging nearly to all the larger decompound species of § *Ctenitis*, and the majority of specimens quoted in papers by several authors, f. inst. Grisebach, Hooker, Fournier, Sodiro, Christ belong to other species; on the other hand Christ has described as new species plants that are typical *D. ampla*. It is, therefore, necessary to give a detailed description of the species as I understand it. I compile my description partly from the original *P. Sloanei*, with which a complete leaf from Panama (Maxon no. 5786) perfectly agrees, partly from the type-specimen of *P. amplum* Willd. thus, noting in parenthesis the differences observed between *P. Sloanei* and *P. amplum*.

Rhizome or caudex erect, 4—5 cm thick (»fougère arborescent de 3 à 4 m de haut«, Léon on label, it is caudex + leaves, I think), thickly covered by a dense mass of wool-like, silky, bright-brown or yellowish-brown, intertangled scales, which are 4 cm or more long, scarcely 1 mm broad, very thin, entire. Base of stipe with a large tuft of similar scales. »Fronds 12—14 in number, arching in a perfect crown« (Maxon on label). Stipe up to 70 cm long, 7—8 mm thick below, somewhat angular when dried, shallowly trisulcate above, greenish stramineous, rarely brownish, when fresh densely covered with pale-brown lanceolate, antrorse scales, which are appressed to the stipe, loosely fixed and therefore easily lost in the herbarium; they leave a red point on the stipe when falling. Lamina deltoid in outline, 1 m long or more, but often much smaller, pale or yellowish green (brownish in type-sp.), firmly herbaceous, quadripinnate below, tripinnatifid upwards to short of the acuminate apex. Pinnæ in about 12 pairs, the basal ones subopposite, the upper alternate, at distances of 5—8 cm. Basal pinnæ the largest, 35 cm long on stalks 3 cm long, acuminate, their lower half unequal-sided having the basiscopic side much produced with the basal lower pinnula, that is about opposite to the second pinnula of the acroscopic side, larger than the second, deltoid-oblong and nearly bipinnate at base. Middle pinnæ oblong, 30 cm long, 8—9 cm broad, mostly straight, sometimes a little erect, shortly acuminate, on stalks about 1 cm long, bipinnatifid to short of the apex, sometimes bipinnate at base. Secondary pinnulæ about 20-jugate,

at distances of 2 cm, at right angles to the rachis of the pinna, the lower ones generally curved backwards, 5 cm long, $1^1/_2$ cm broad, the edges parallel below the acuminate apex (in type-sp. acute), the basal ones, the first of which being the basiscopic one, shortly petiolate and triangular in outline, the middle ones sessile, the upper adnate with the posterior base, the uppermost ones decurrent and confluent, all, the uppermost excepted, pinnatifid nearly to the midrib or fully pinnate at base. Tertiary segments 10—12-jugate, a little oblique, 8—9 mm long, 3—4 mm broad throughout, obtuse or subacute (in the type-sp. the apex is more bluntly rounded on the lower side), the margins toothed with about 4 oblique or subfal-

Fig. 9. D. ampla (Willd.) O. Ktze. Typical secondary pinnules, nat. size, and segments × 2.

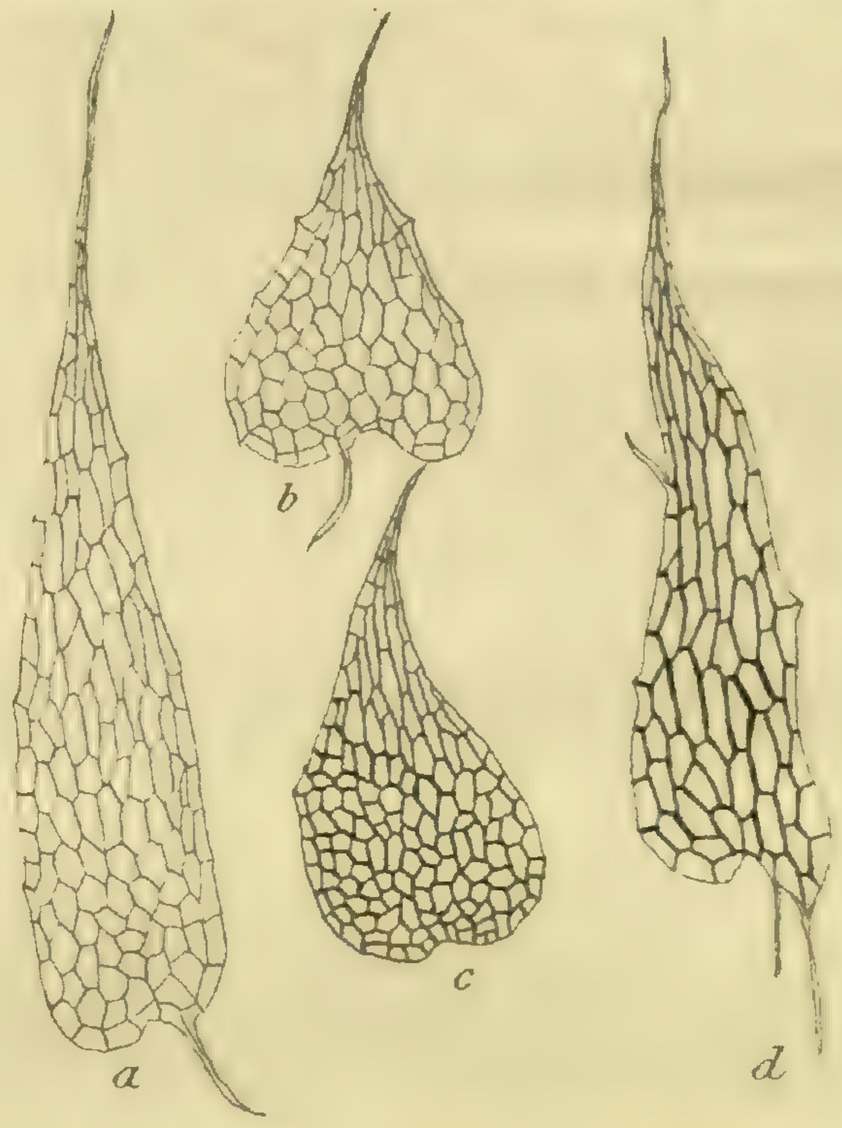

Fig. 10. Scales from the midrib of secondary pinnulæ beneath. a. *D. ampla;* b. *D. excelsa,* c. *D. equestris;* d. *D. equestris* var. *heterolepis.*

cate, subacute teeth on each side; basal segments of larger pinnulæ pinnatifid, most deeply so on the lower side. — Rachis scaly like the stipe, the lanceolate, reddish- or yellowish-brown, glossy scales especially numerous and accumulated in the axils and on the stalks of the pinnæ; these scales are flaccid, cordate at base hair-pointed, the margins somewhat lacerato-ciliate, their cells mostly rectangular with concolorous walls excepting those of the cells that surround the base, which are thicker and darker; (in the type-sp. these scales are more reddish-brown and larger than in *P. Sloanei)*; the furrow of the rachis above is under the scales densely pubescent by short, red, articulated hairs. Midribs of pinnæ and pinnulæ above rusty-pubescent by short *Ctenitis*-hairs intermixed with some few, small scales, the midribs and

veins of tertiary segments above and margins with some scattered, similar hairs; upper surface besides more or less glanduloso-pubescent by short cylindrical hairs (very slightly so in the type-sp.). Scales of the midribs of pinnæ beneath similar to those of the stalks of the pinnæ but smaller, generally numerous, rather appressed, antrorse, those of the midribs of pinnules and tertiary segments more ovate-acuminate, divaricating, often a little darker in colour (Fig. 10 a); under-surface throughout glandular by small cylindrical hairs, most densely so on midribs and veins. — Veins of a middle-sized tertiary segment about 6-jugate, those of the 4—5 lowest pairs furcate in the marginal teeth, reaching the margin; midvein of a posterior basal, adnate or decurrent segment springs out from the midrib of the secondary pinnula above its base and is equally pinnate to both sides. Sori small, consisting of scarcely a dozen of sporangia, near the very base of the anterior branch of the furcate veins, about medial between midrib and edge; commonly the whole leaf is soriferous from base to the very apex of frond and pinnæ (in type-sp. the outer two thirds of the pinnæ is without sori). Indusia very small, very early fugacious, pale and thin, often not found, glanduloso-ciliate (in type-sp. small, reddish). Sporangia few, easily falling; spores echinulate.

D. ampla, as here interpreted, has a rather limited distribution: the northern Andes of Venezuela, Colombia and Ecuador to Costa Rica and Guatemala, Jamaica and Cuba, from where it has found its way to Florida, and the southern Lesser Antilles from Trinidad to St. Vincent, where it is perhaps not indigenous but escaped from cultivation, at least in Trinidad; Galapagos is a more remote locality. Specimens from other regions, previously referred to *D. ampla* belong to other species: those from the middle Lesser Antilles to *D. excelsa* and *D. meridionalis*, from Northern Central America with Mexico to *D. equestris*, from Bolivia-Peru to *D. nemophila*; the Bermudan »D. ampla« is my *D. meridionalis* v. *speluncae*. — The species is not subject to greater variations; it varies, of course, in size and subsequently in the degree of cutting, in colour that is sometimes, although rarely, fresher green, in the number of scales and in the density of the glandular, cylindrical hairs. *A. culcita* Christ was based on old leaves of the typical form, and *Pol. paleaceum* of Hook. fil., at least of Andersson, from Galapagos is scarcely to be separated even as form. It was suggested by Baker (Syn. 285) that it might be a form of *Aspid. furcatum* Kl., which is certainly wrong; unfortunately I have (Ind. Fil.) followed Baker and referred it to *D. furcata* as a variety, and Stewart (loc. cit.) calls it *D. furcata*. He enumerates a long series of specimens, so that it seems to be frequent on most of the islands. The largest specimen seen is exactly a middle-sized *D. ampla*, but other specimens are smaller and most of them have a more scaly rachis than is common in the species. At best it is a dwarfy form developed in exposed localities on the high mountains of the islands.

I regard the following specimens as typical:

Florida: in hammocks near Cutler (Costello's hammock), J. K. Small and J. J. Carter: A. A. Eaton (W).
Cuba, ad Cahoba, Poeppig (B, RB = *P. Sloanei* Poep.); Lomas de Tapaste, Léon nr. 3530 (R).
Sto. Domingo, Balbis (B).
Jamaica: near Mandeville, Maxon nr. 2575 (W); Cloverty Cottage, St. Georges, Portland, Alex. Moore (W); Hart nr. 120 (W).
St. Vincent: Mt. George, Eggers nr. 6843 (RB) 6843 (B), 6848 (W); H. H. & G. W. Smith nr. 148 (B, RB, W), 860 (B).
Grenada, R. V. Sherring nr. 242 (B, W).
Trinidad, Fendler nr. 19 (B, W); Bot. Gard. Herb. nr. 320 (W), 370, 1942 (B, RB), 3455, 3469 (R); Broadway nr. 115 (RB); Don (L).
Venezuela: Caripe, Humboldt (B); Island of Margarita, Juan Griego trail, J. R. Jonston nr. 187 (W); O. O. Miller and J. O. Johnston nr. 169 (B, W).
Colombia: Sta. Marta, Funk nr. 256 (B), Schlim nr. 281 (RB), Stübel nr. 368 (B), H. H. Smith nr. 1024 (Rg, RB).
Panama: Porto Bello, Billberg nr. 326, 328, 329 (S), Hayes nr. 63 (B), Pittier nr. 2425 (W), Maxon nr. 5786 (CC, W); above El Boquete, Chiriqui, Maxon nr. 5217 (CC, W).
Costa Rica: Turrialba, Pittier nr. 4086 (W); Puerta Viejo, Pittier nr. 7504 (RB = *Pol. prasinum* Christ); bassin du Reventazon, Pittier nr. 8201 (B, RB); Rodeo de Pacaca, Pittier nr. 3257 (RB); Llanuras de Santa Clara, Donnell Smith nr. 6894 (W); Navarro, Wercké (RB, W, incl. the type of *A. culcita* Christ); Serapiqui, C. Hoffmann (B); forêts de Bunce, Tonduz nr. 4436 (RB); Tucurrique, bords du rio de Las Vueltas, Tonduz nr. 12800 (B, CC, RB, W); près S. Ramón, Tonduz nr. 14243, 14254 (W); Guadeloupe, Alfaro nr. 16579 (W)! Cangrejal de Aserri (Pac.), P. Biolley nr. 45 (RB, W); Linie (?), Brade nr. 173 (R); Surubres, P. Biolley jun. nr. 17386 (W), 17595 (B).
Guatemala. Depart. Escuintla: Torolá, Donnell Smith nr. 2455 (B, W — distributed as *Nephrodium catocarpum* Hook.); Dept. Retalhuleu: San Felipe, Donnell Smith nr. 2735 (B, RB, W); Dept. Santa Rosa: Rio de Los Esclavos, Heyde et Lux ed. J. D. S. nr. 3249 (B, W); Jumaytepece, Heyde et Lux ed. J. D. S. nr. 4085 (RB).
Equador: Chimborazo, Spruce nr. 5716 (CC).
Galapagos Islands (*Pol. paleaceum* Hook. f.) Andersson (Kew, L, S); A. Lee (W), Markham (B).

var. subdryopteris (Christ).

Syn. *Phegopteris subdryopteris* Christ, Prim. Fl. Costaric. **3**: 36. 1901.
Dryopteris subdryopteris C. Chr. Ind. 295. 1905.

Differs from the type by its basal scales that are of a deep brown colour, glossy; scales of stipe and rachises more bright brown but darker and a little broader than those of the type; in structure and shape they scarcely differ. Both surfaces, especially the upper one, very densely glanduloso-pubescent; colour of lamina when fresh grass-green, when dried yellowish or brownish green. Sori somewhat supramedial. Indusia not found.

This variety apparently approaches the species of the group of *D. hirta* by the colour of the basal scales, but they have the same soft, silky appearance as those of typical *D. ampla*, and the shape of the basal pinnæ is as in *D. ampla*. From *D. equestris* it differs by soft texture, dense pubescence by glandular hairs, by more lanceolate scales of the axils of the pinnæ etc.

Costa Rica: El Copey, bords du rio Pedregoso, 1800 m, Tonduz nr. 11852 (W; type-number); Carpintera, C. Brade nr. 122 (R, W).

314. **Dryopteris excelsa** (Desv.) C. Chr. Ind. 264. 1905, excl. syn.

Syn. *Polypodium excelsum* Desv. Prodr. 243. 1827.

Type from the West Indies, exact locality not indicated (Fragment in B!)

Perhaps a variety of *D. ampla*, but all specimens of so-called *D. ampla* seen from the islands of Martinique, Dominica and Guadeloupe are remarkably constant as to certain characters, by which they differ from *D. ampla*. — In size and cutting *D. excelsa* scarcely differs from *D. ampla*, and it has a similar large tuft of linear, silky scales at base of the stipes. The appressed scales of the stipes are broadly ovate or ovate-lanceolate, cordate and entire, yellowish-brown, thin, consisting of isodiametrical cells; rachis with similar, as a rule very few sçales; those of the axils of the pinnæ ovate or ovate-lanceolate, concolorous, yellowish-brown, or sometimes somewhat darker in the middle; scales of midribs of secondary pinnæ beneath smaller, divergent, ovate shortly acute, as a rule darker and somewhat vaulted and iridescent (Fig. 10 b). Surfaces nearly without glandular hairs, the margins not ciliated. Secondary pinnules often long acuminated; tertiary pinnules oblique, long decurrent. $1^1/_2$—2 cm long, 4 mm broad, obtuse or shortly acute, rather deeply incised with about 5 falcate, subacute lobes on each side. Indusium not found.

By these characters *D. excelsa*, I think, may be safely distinguished from *D. ampla;* its broader, more oblique and long decurrent tertiary pinnulæ of the lower pinnæ give it a somewhat different habit; the lamina is often fresh green. It is more difficult to find good distinguishing marks between it and *D. equestris*, with which METTENIUS united it, a treatment followed in Ind. Fil. *D. equestris* has, however, the margins ciliated, indusia are not rarely found, the surfaces of not too old specimens more or less glanduloso-pubescent, the scales are darker and the segments more shortly decurrent.

Martinique, Père DUSS nr. 1562 (B, RB), 1581 (BB) s. n. (B) BÉLANGER (RB).
Dominica, IMRAY nr. 56 (H, B).
Guadeloupe, L'HERMINIER nr. 29 (B, RB), 120 (B); Père DUSS nr. 4061 (W), 4340 (B, RB); HUSNOT nr. 390 (B); HERTER nr. 5337 (RB).

315. **Dryopteris equestris** (Kunze) C. Chr. comb. nov.

Syn. *Aspidium equestre* Kze. Linnaea **18**: 347. 1844; Mett. Aspid. 73 nr. 175.
Lastrea ciliata Liebm. Vid. Selsk. Skr. V. **1**: 273 (seors. 121). 1849!
Polypodium alsophiloides Liebm. l. c. 208 (seors. 56)!
Aspidium Bourgaei Fourn. Mex. pl. **1**: 98. 1872!
Dryopteris Bourgaei C. Chr. Ind. 255. 1905.
Aspidium scabriusculum Davenp. Bot. Gaz. **21**: 255. 1896!
Dryopteris Davenportii C. Chr. Ind. 260. 1905.
Type from Mexico, leg. LEIBOLD nr. 42 (not seen).

METTENIUS, who evidently knew authentical specimens of *A. equestre* Kze., has referred to this species a series of specimens in B, which agree with *Lastrea ciliata*

Liebm. Knowing how exact METTENIUS was in his determinations I do not hesitate to call the present species *D. equestris*, although KUNZE described the costæ as being »bullato-squamose« beneath, which, as I understand the term, is not the case in any form referred hereto by me; still the scales are often rather vaulted, and KUNZE has perhaps called such scales »bullate«.

D. equestris is a critical and variable species, closely related to *D. ampla*, and it is not always easy to distinguish it from that species, which, as far I know, does not occur in Mexico. The form that I consider typical differs from *D. ampla* by its lamina being vivid green to dark green and by the scales. The basal scales form a generally smaller tuft than in *D. ampla* and are of a darker colour, reddish brown or nearly castaneous; those of the stipe, rachis and costæ are less numerous, often few, ovate-lanceolate or ovate, rarely bright brown, as a rule lurid-brown with paler edges; scales of the midribs of secondary pinnæ beneath divaricating, broadly ovate or ovate-lanceolate, shortly acuminate, lurid-brown, glossy, often iridescent (Fig. 10 c). Upper surface with *Ctenitis*-hairs along midribs and veins and edges, not glandulose, underside somewhat glanduloso-pubescent on the midribs, with age glabrous. In cutting some forms scarcely differ from *D. ampla*, still the secondary pinnules are, as a rule, more oblique and somewhat upcurved, the tertiary segments of larger specimens are acute and deeply lobed with falcate lobes. Sori commonly confined to the lower two-thirds of the larger pinnæ, rather small, often red-brown. Indusia deciduous, reddish, glandular, ciliate.

D. equestris is a most variable species, if really all the specimens referred to it rightly belong here. In some specimens the indusia are subpersistent, f. inst. *L. ciliata* Liebm., in others I have not found a trace of an indusium (*P. alsophiloides* Liebm.), but otherwise indusiate and exindusiate forms are perfectly similar, and I have not succeeded in finding any other constant character by which they were to be distinguished from each other. *A. Bourgæi* Fourn., with which *A. scabriusculum* Dav. is identical, is a form with more remote, shorter and broader, ovate-oblong secondary pinnulæ; it is very large, the basal pinnæ nearly 50 cm long.

Mexico. Vera Cruz: S. Antonio Huatusco, LIEBMANN nr. 2394 (H = *Lastrea ciliata* Liebm.); Vallée de Cordova, BOURGEAU nr. 1452, 1838 (B, S, W), 1839 (H, RB = *A. Bourgæi* Fourn.), 2172 (H, RB), H. FINK nr. 59, 61, 141 a (W), C. R. ORCUTT nr. 3214 (W); Ravines above Orizaba, PRINGLE nr. 6132 (B, Kew, RB, S, W = *A. scabriusculum* Dav.); Zahuapan, C. A. PURPUS nr. 2932, 4253 (W). — Oajaca: Trapiche de la Concepcion, LIEBMANN nr. 2406 (B, H = *Pol. alsophiloides*); Cincatlàn, CONZATTI nr. 728 (RB) — MICHOACAN: Falls of Fzararacua Uruapan, PRINGLE nr. 13919 (W) — Tepic: E. PALMER nr. 1951 (W); Pedro Paulo, J. N. ROSE nr. 3327 (W).

Guatemala, Dept. Sololá: Santa Barbara, W. C. SHANNON ed. J. D. S. nr. 249 pt. (W) — Dept. Zacatepequez: San Rafael, DONNELL SMITH nr. 2731 (W)! Volcan Acatenango, DONNELL SMITH nr. 2739 (W), W. A. KELLERMANN nr. 5242 (W) — Dept. Quiché: San Miguel Uspantan, HEYDE et LUX ed. J. D. S. nr. 3250 (W) — Dept. Santa Rosa: Volcan Jumaytepeque, HEYDE et LUX ed. J. D. S. nr. 4425 (W) — Vicinity of Cacao, H. S. BARBER nr. 173 (W) — All specimens of the DONNELL SMITH collection were distributed as *Nephrodium amplum* Baker.

With *D. equestris* I associate the following two forms as varieties, although it is highly probable that they are really valid species.

var. **mentiens** n. var.

Differs by its more remote pinnules and segments, which latter are more patent, broader and most of them fully entire and bluntly rounded at apex. Sori indusiate. Basal scales dark-brown, but scales of midribs similar to those of the typical form. — By its broad, mostly entire tertiary segments with rounded apex this variety resembles closely in habit *D. subincisa*, from which it differs distinctly by pubescence and venation.

Guatemala; Dept. **Alta Verapaz**, near Coban, v. TÜRCKHEIM nr. II. 2118 (W), Pansamalá, v. TÜRCKHEIM ed. J. D. S. nr. 1054 (B, W — distributed as *Nephrodium catocarpum* Hook?)

var. **heterolepis** n. var.

Syn. *Aspidium effusum* var. *muticum* Christ, Prim. Fl. Costar **3**: 32. 1901.

A very large form with pinnæ up to 75 cm or more long, in habit remarkable by its very long stalks of the pinnæ and pinnules and by its very remote pinnules; stalks of basal pinnæ up to 10 cm long, those of the lower pinnulæ 4—5 cm long. In colour, shape of the tertiary segments and scales of the midribs beneath (Fig. 10 d) scarcely differs from typical *D. equestris*, but the scales of stipe, rachis and axils are very characteristic. They are of two kinds: 1) closely appressed, broadly ovate, reddish brown, at base fimbriate, smaller scales, and 2) covering them some fewer, lanceolate, coal-black, pale-edged, more patent scales; all are very loose and easily rubbed off, so that they are to be found in the axils and in the furrow of the rachis. Basal scales simular to those of *D. ampla*. Sori exindusiate. — Probably a valid species.

Panama: Vicinity of El Boquete, Chiriqui, MAXON nr. 4951 (CC, W, type). 5011 (W?, see below).
Costa Rica; Cabeciras del Bkís, PITTIER nr. 10597 (W = v. *muticum* Christ).

MAXON nr. 5011 is probably the same, having the same scales as nr. 4951, but it is unique within the whole group by having the acroscopic pinnulæ of the basal pinnæ nearly as much developed as the basiscopic ones; thus the basal pinnæ are therefore, nearly equally and very broadly deltoid, the second pair of pinnæ is similar in shape, but the upper ones are just like those of nr. 4951.

316. **Dryopteris palatangana** (Hook.) C. Chr. comb. nov.

Syn. *Nephrodium* (Lastrea) *Palatanganum* Hook. sp. **4**: 260 in nota. 1862.

Type from Ecuador: Pallatanga, leg. SPRUCE nr. 5256 (Kew!); only specimen seen.

Although I know this fern only from the original specimen that consists of two pairs of pinnæ and the base of a stipe, I do not hesitate to place it here as a valid species. It is certainly closely related to *D. ampla*, with which BAKER

united it, and to *D. nemophila,* but the whole aspect of the plant is rather different from both, and it seems to be well-marked by its scales. The basal scales are of the same reddish-brown colour as those of *D. nemophila;* rachis, midribs of pinnæ and pinnulæ beneath are, especially at the axils, densely covered with appressed, antrorse, broadly lanceolate dirty- or blackish brown, glossy scales, which consist of numerous, small cells and are toothed or shortly fimbriate throughout along the margins. Both surfaces densely glandulose throughout with glossy, glandular hairs. — Pinnæ ovate-oblong-acuminate, 25 cm long, curved upwards; secondary pinnulæ oblong-acuminate, tertiary ones fully free at base at the lower half of the secondary pinnulæ, sessile or adnate, 7—8 cm long, 2 cm broad, somewhat falcate, bluntly obtuse, incised more than halfway down into about 6—8 pairs of falcate, truncate quaternary segments. Indusia rather persistent, reddish, glanduloso-ciliate. Texture herbaceous, colour dark-green. For other details see Hooker's description.

In cutting it resembles *D. ampla,* still the pinnæ are ovate-elongate, not lanceolate, and upcurved; the obtuse tertiary pinnulæ resemble those of *D. nemophila.*

317. **Dryopteris nemophila** (Kze.) C. Chr. comb. nov. — Fig. 11.

Syn. *Aspidium nemophilum* Kze. Linnaea **9**: 95. 1834.
Aspidium catocarpum Kze. Linnaea **9**: 95. 1834; Mett. Aspid. 73 nr. 174.
Dryopteris catocarpa O. Ktze. Rev. Gen. Pl. **2**: 812. 1891; C. Chr. Ind. 257.
Aspidium furcatum Kl. Linnaea **20**: 371. 1847 (misprint for »*fuscatum*«).
Dryopteris furcata O. Ktze. Rev. Gen. Pl. **2**: 812. 1891; C. Chr. Ind. 267 (excl. var.)
Dryopteris fuscata Hieron. Hedwigia **46**: 347. 1907.
Type from Peru: ad Pampayacos, leg. POEPPIG 1829 (not seen).

A large species related to *D. ampla* but very distinct. Base of stipe with a large tuft of linear, silky, beautiful scales that are of a deeper reddish-brown colour than those of *D. ampla.* Stipe 2 cm thick, 1—1½ m long or more, deeply furrowed above, clothed with numerous, lanceolate, reddish brown, appressed and antrorse scales. Lamina up to 2 m, perhaps 3 m high, membranous, dried of a reddish-brown colour, pinnatifid. Basal pinnæ the largest subopposite, 1 m or more long, with the basiscopic pinnules of the lower third produced, from the third or fourth pair of pinnules equalsided. Medial pinnæ 50 cm or more long, acuminate, stalked, often falcate. Secondary pinnules at distances of 3—5 cm, the lower ones short-stalked, most of them sessile, the upper ones adnate and shortly decurrent, somewhat falcate, shortly acuminate, incised below to costa. Tertiary segments oblong, up to 2 cm long, 5—7 mm broad, nearly of the same width from base to tip, abruptly decurrent at base the apex obtuse or bluntly rounded, toothed, the margins incised halfway down into about 10 close, falcate, truncate lobes on each side. Rachis and midribs of pinnæ and pinnules beneath rather densely fibrillose with lanceolate-acuminate, reddish-brown, antrorse scales, midribs of tertiary segments beneath with similar

but smaller and more ovate-lanceolate and divergent scales. Margins ciliated with articulated hairs; surfaces glabrous the midribs excepted that are rusty-pubescent like other species of § *Ctenitis*. Veins in ultimate lobes pinnate, c. 3-jugate, simple, somewhat pellucid, that of the posterior basal adnate lobe springs out from the costula above its base and is often pinnate on the upper side only. Sori medial on the vein, generally distributed over the whole lamina, small. Indusia subpersistent, reddish, glanduloso-pubescent and ciliate.

METTENIUS united into a single species, *A. catocarpum*, two species described by KUNZE, *A. nemophilum* and *A. catocarpum*, both Peruvian, and since the name *nemophilum* has been entirely forgotten. Unfortunately METTENIUS used the name *catocarpum*, although it is evident that *A. nemophilum* is the fully developed state of the species, and morover, it is the species first described. It is probable that METTENIUS has seen the original specimens of KUNZE's two species, and I have come to the conclusion that he was right in uniting them; his description is drawn up after specimens from Venezuela and Colombia, which I have examined and which agree rather well with the original description of *A. catocarpum*. When I prefer the specific name *nemophila*, it is not caused by the reasons mentioned above only, but also because I have a specimen from Peru (RUIZ nr. 69), which is determined *A. nemophilum* by KUNZE himself, and which exactly agrees with the original description. With this specimen correspond perfectly some others from Ecuador, collected by SODIRO and MILLE (*Nephr. amplum* Sod. part.). They represent the form described above. This form is easily distinguished from *D. ampla* by its much larger size, its very obtuse tertiary segments with close, falcate lobes, and by the subpersistent, reddish indusia. The colour of the scales are different but in shape and structure similar to those of *D. ampla*, the brown colour of the dried leaf that is less glandular is very characteristic.

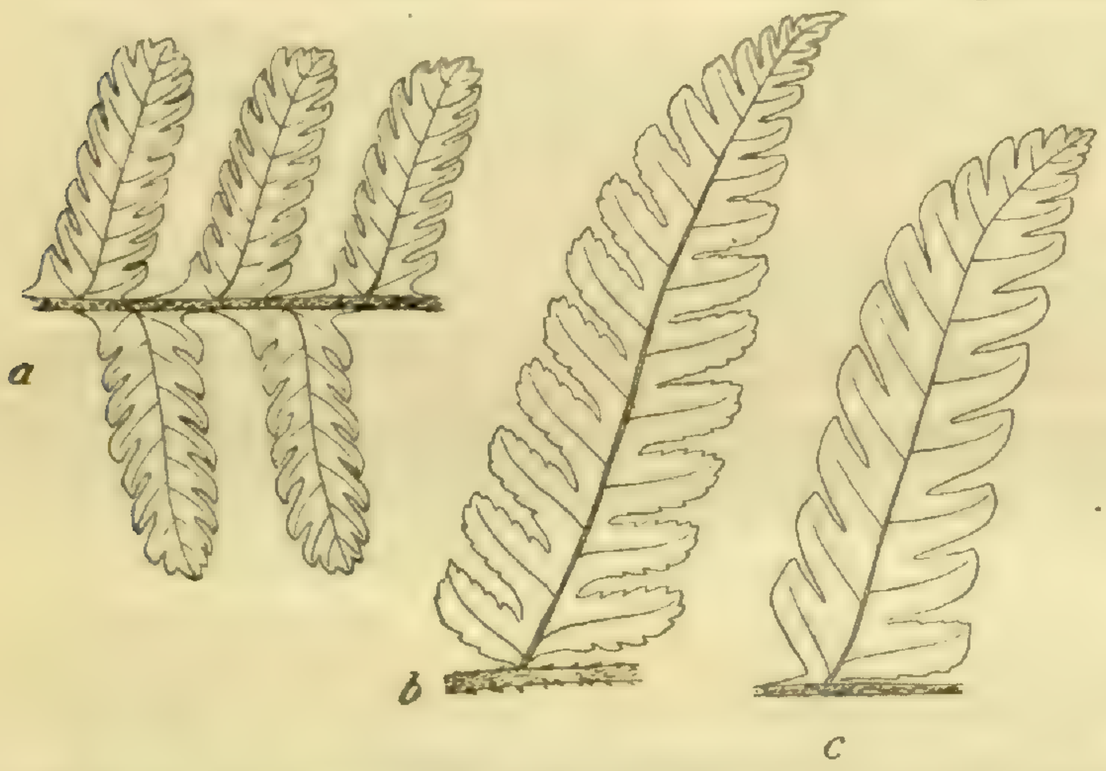

Fig. 11. *D. nemophila* (Kze.) C. Chr. a. Five tertiary pinnules of the typical form. b. secondary pinnula of *f. fuscata* (Linden n. 1020); c. ditto of *f. catocarpa* from N. Argentina, all nat. size.

The main-difference between the described typical form and the form described as *Aspidium furcatum* Klotzsch is the smaller size and less divided leaves of the latter; the tertiary segments being scarcely more than faintly dendate. *Aspidium catocarpum* Kze. is still smaller and less divided; its longest pinnæ are 20—30 cm long or shorter, most secondary pinnulæ sessile, decurrent at base, obtuse and incised till more than halfway to the costule into oblique, oblong, obtuse entire, often falcate lobes. A secondary pinnula of this form resembles in size and cutting a

tertiary pinnula of the typical form. Several specimens seen which correspond to the characters of *A. catocarpum* seem in reality to be younger, not full-grown plants of the genuine form. Besides the differences in size and cutting I find no essential differences in the minute characters, and I therefore here prefer to unite all these forms under one species.

D. nemophila is distributed along the Andes from Northern Argentina. Peru and Bolivia to Venezuela; I have seen no specimens from Central America. In B are to be found fragments of this species said to be collected in Mexico and Brazil, which is an error, I think. — Specimens examined:

Peru, Panatahuas province, Ruiz nr. 69 (B = *Pol. amplum* Kl. Linn. **20**: 389); near Tarapoto, Spruce nr. 3942 (Kew); without locality, Mathews (B).

Argentina, prov. Jujuy, Quinta pr. Laguna de la Brea, in palude, Rob. E. Fries nr. 222 (Rg).

Bolivia: Polo-Polo near Coroico, Yungas, O. Buchtien nr. 3597, 3599, 3608 (R); Tres Cruces, Herzog nr. 1581 (R) (all f. *catocarpa*).

Ecuador: between Baños and Pintuc, Pastaza valley, Stübel nr. 920, 948 (B); Pallatanga valley, Sodiro (RB); S. Miguel de los Colorados and St. Domingo, Sodiro nr. 115, 144 (Budapest).

Colombia: without locality, Linden nr. 1020 (Kew, B, Budapest), 1033 (B = *catocarpa*); near La Plata, Stübel nr. 1261 (B); Páramo de Moras, Stübel nr. 1270 (B).

Venezuela: Caracas, Linden nr. 124 (Kew, RB); Gollmer (B); Moritz nr. 37 (B = *A. furcatum* Kl.); Tovar, Moritz nr. 435 (B, RB); Fendler nr. 204 (Kew) — all f. *catocarpa*.

4. Group of D. subincisa.

This group includes about thirty known species, most of which are large, decompound, some of them veritable tree-ferns with a trunk 1—2 m high. From the former groups this is marked especially by the rather thick texture of the leaf, its generally dark green colour and the pubescence. *D. grandis* and *D. adenopteris* excepted all species have the costæ and costules above strigose by antrorse whitish or brownish, subulate and often falcate, rather stiff and long hairs, below which most often common *Ctenitis*-hairs are to be found, and most species are more or less pubescent either by short unicellular, common hairs or pilose by long, flexible, paucicellular but not articulated, whitish hairs. The scales are few or many, nearly always clathrate with toothed margins, sometimes entire, most often rigid, castaneous. The basal scales rarely form a large tuft as in *D. ampla*, mostly so in *D. Karsteniana* and *D. connexa*.

In circumscription the lamina of the tripinnatifid species is deltoid-ovate or deltoid with the lower pinnæ the largest and produced downwards. Most species show a characteristical feature, by which they can easily be distinguished from *D. ampla* and its allies. In the tripinnatifid lamina the basal posterior tertiary segment are nearly separated from that above it and broadly adnate to the costa of the pinna; its midvein runs out from the costa often 1—2 mm from the base of

the costula of the secondary pinnula. The ultimate segments are generally broad oblong, obtuse, and the veins do no reach the margin.

Naturally some of the bipinnatifid species dealt with in the first part of this monograph must be placed ind the present group, viz. *D. honesta, yungensis, biserialis, leptosora, platyloba* and *D. hirsuto-setosa*. They differ from the bipinnatifid species of the group of *D. submarginalis* by their furcate veins and pubescence with other hairs than *Ctenitis*-hairs. The three first species together with *D. macrotheca* form a special small group, characterized by brown colour of the dried leaf; *D. leptosora* and *D. platyloba* are intimately related to *D. vasta* and it is a matter for conjecture whether these species are not less divided forms of *D. vasta;* it seems probable that several of the species of this group vary during life-time growing with age larger and becoming more divided. *D. hirsuto-setosa* is similarly a less divided species allied to *D. Karsteniana.*

Concerning the sori we have within the group two series of species, one with exindusiate, the other with indusiate sori, and originally I made the two series distinct groups within the subgenus. A comparative study of all species will show, however, that the character indusiate or not can not be considered a principal one. Considering several other characters we find that the indusiate species are less related *inter se* than they are to exindusiate species. Thus *D. villosa* is certainly closely related to *D. Karsteniana, D. andicola* to *D. atrogrisea, D. villosula* to *D. molli-coma* and *D. crenulans* much nearer related to other Brazilian species than to *D. villosa*. Some authors, f. inst. JENMAN, united into one species both the indusiate and exindusiate forms, but I have never found evidence that the very same species may be found with and without indusia; the presence or abscence of indusia is to me, at least as regards these species, a good specific character. It is, of course, rather difficult to use that character by the determination of specimens, as sometimes all the indusia of dried specimens have fallen off.

In this group I place with some doubt the new species *D. adenopteris,* which comes very near to the *ampla*-group, as does also *D. lunensis;* the xerophytic *D. hirtula* from Brazil looks very peculiar, still I think its best place is within this group. *D. grandis* differs from all other species by the costæ above being perfectly glabrous without *Ctenitis*-hairs.

Working out the following key I have especially considered the scales and pubescence; METTENIUS has (Fil. Lechl. II) given a key to the species known to him and there especially taken the shape and structure of the scales into consideration; the characters pointed out by him are, however, not all constant, and I cannot use them. It is convenient to use the scales and pubescence in a key, because most of the specimens of the herbaria are very fragmentary, generally a single pinna of a leaf. Such characters as shape and degree of division, colour and structure of the basal scales are, therefore, of little value by the determination of such large species. The scales of the pinnæ, their pubescence can, on the contrary, always be examined.

Key to the Species.

1. Sori exindusiate, or (in *D. adenopteris*), furnished with minute, fugacious indusia. 2
— Sori indusiate; indusia large, coriaceous, generally persistent. Large species with tri-quadripinnatifid lamina, very hairy with long hairs or downy beneath. 39
2. Lamina bipinnatifid-tripinnatifid, often tripinnate at base. Tertiary segments of middle pinnæ entire or faintly crenate or serrate. 3
— Lamina tripinnatifid-quadripinnatifid, quadripinnate at base. Tertiary segments of middle pinnæ at least pinnatifidly lobed. Very large species. 29
3. Lamina bipinnatifid at the middle; secondary segments of middle pinnæ entire; lamina lanceolate or ovate-lanceolate. 4
— Lamina tripinnatifid at the middle, deltoid or deltoid-ovate; secondary pinnulæ deeply lobed. 12
4. Lamina glabrous or short hairy or with a few longer hairs. 5
— Lamina throughout villous with long, flexible hairs. 11
5. Costæ above strigose with shorter or longer antrorse hairs. Andine and West-Indian species. 6
— Costæ above perfectly glabrous. Brazil. 335. *D. grandis* (Pr.) C. Chr.
6. Costæ beneath glabrous or with some few longer hairs; lamina brownish when dried. 7
— Costæ beneath pubescent with short hairs, often with longer hairs intermixed, lamina greyish green when dried. 10
7. Andine species. Costæ beneath without whitish hairs. 8
— Guadeloupe. Costæ beneath with some longer whitish hairs; scales numerous castaneous, entire. 321. *D. macrotheca* (Fée) C. Chr.
8. Pinnæ scarcely incised to costa, the segments entire (the lower basal ones excepted). Sori confined to the anterior branch of a forked vein. 9
— Lower pinnæ pinnate with lobed pinnulæ. Both branches of a forked vein frequently soriferous. 320. *D. biserialis* (Bak.) C. Chr.
9. Sori placed at the base of the anterior branch of the forked vein. Scales narrow, dark. 318. *D. honesta* (Kze.) C. Chr. (I nr. 48).
— Sori above the middle of the anterior branch of the forked vein. Scales broader, yellowish. 319. *D. yungensis* (Christ et Ros.) (I nr. 49).
10. Basal segments redused. Costæ beneath shortly pubescent. 322. *D. leptosora* C. Chr. (I nr. 50)
— Basal segments not reduced. Costæ beneath pubescent with shorter and longer hairs intermixed. 323. *D. platyloba* (Bak.) C. Chr. (I nr. 51).
11. Rachises not woolly and without scales. Andes. 327. *D. hirsuto-setosa* Hieron. (I nr. 53)
— Rachises densely woolly with pale scales intermixed. Brazil. 343. *D. hirtula* (Kze.) C. Chr.
12. Andine and West Indian species. 13
— Species from Southeast Brazil (+ Uruguay, Paraguay). 23
13. Lamina beneath glabrous or with scattered longer hairs on costæ and costules or finely downy without long hairs. 14
— Lamina beneath with numerous long, flexible hairs. 20

14. Lamina beneath glabrous or with scattered long hairs on costæ and midribs, not finely downy. 15
— Lamina beneath and rachis finely downy, rarely with longer hairs intermixed. 18
15. Scales dark brown or castaneous, lanceolate; rachis and costæ without raised red spots. 16
— Scales bright brown, entire. Rachis and costæ with raised red spots. Juan Fernandez. 331. *D. inaequalifolia* (Colla) C. Chr.
16. Scales entire. Lamina ovate or ovate-lanceolate, brown when dried. 17
— Scales toothed. Lamina deltoid, green or dark green when dried. Costæ beneath glabrous or with scattered hairs. 324. *D. subincisa* (Willd.) Urb.
17. Costæ beneath without whitish hairs. Andes. 320. *D. biserialis* (Bak.) C. Chr.
— Costæ beneath with whitish hairs. Guadeloupe. 321. *D. macrotheca* (Fée) C. Chr.
18. Scales of costæ lanceolate, dark, blackish or castaneous. 19
— Scales bright-brown, thin, ovate-lanceolate, entire. 329. *D. lunensis* (Christ) C. Chr.
19. Scales toothed. Upper basal tertiary segment not enlarged. 324. *D. vasta* (Kze.) Hieron.
— Scales entire. Upper basal tertiary segment somewhat enlarged. 326. *D. spectabilis* (Kze.) C. Chr.
20. Lamina eglandulose, most hairs long, flexible. 21
— Lamina beneath glanduloso-pubescent, long hairs fewer; scales bright-brown, thin, ovate-lanceolate, entire. 329. *D. lunensis* (Christ) C. Chr.
21. Lamina ovate-lanceolate, bipinnate with subentire pinnules; scales few or none; very hairy. 327. *D. hirsuto-setosa* Hieron.
— Lamina deltoid or deltoid-ovate, tripinnatifid-tripinnate. 22
22. Scales of costæ lanceolate, fuscous or castaneous, toothed. 328. *D. atrogrisea* n. sp.
— Scales of costæ ovate or ovate-lanceolate, bright-brown, entire. 330. *D. pansamalensis* n. sp.
23. Costæ above quite glabrous. Lamina bipinnate-bipinnatifid. 335. *D. grandis* (Pr.) C. Chr.
— Costæ above differently pubescent. Lamina tripinnatifid. 24
24. Rachis and both surfaces glabrous (costæ above excepted) or with scattered long hairs beneath or the costæ beneath shortly pubescent. 25
— Rachis and both surfaces softly villous or woolly with long, flexible hairs. 28
25. Costæ above rusty-pubescent with short, articulated hairs, common hairs throughout absent. Scales broad-ovate, yellowish, thin, fimbriate. Rachises often very zigzag. 298. *D. flexuosa* (Fée) O. Ktze. (ante p. 33).
— Costæ above strigose by antrorse, subulate hairs; costæ and costules beneath puberulous or with scattered long hairs or glabrescent. 26
26. Scales of costæ and costulæ beneath lanceolate or linear, fuscous 27
— Scales of costæ and costulæ ovate or ovate-lanceolate, bright- or reddish-brown, those of the base of stipe castaneous, rigid, subentire; costæ and costæ beneath puberulous. Lamina chartaceous, often shining. 339. *D. macrosora* (Fée) C. Chr.
27. Scales of rachis and costæ few, linear, those of the base of stipe very long, soft and intertangled. Costæ beneath glabrous or with scattered long hairs. 336. *D. connexa* (Klf.) C. Chr.
— Scales of rachis and costæ numerous, lanceolate; costæ beneath shortly puberulous. Lamina dark green. 337. *D. umbrina* n. sp.

28. Large species in habit similar to *D. subincisa*. Rachises not woolly and the scales very few or none, linear, dark. 337. *D. Blanchetiana* (Kze.) Hieron.
— Smaller species, in habit similar to species of *Athyrium* (f. inst. *A. alpestre*); rachises very densely woolly with pale scales. 343. *D. hirtula* (Kze.) C. Chr.
29. Lamina not glanduloso-pubescent. 30
— Lamina glanduloso-pubescent. 37
30. Andine-West-Indian species, one from Juan Fernandez 31
— South-Brazilian species. 35
31. Primary and secondary rachises with numerous castaneous, lanceolate scales; costæ and costules beneath glabrous or shortly puberulous without long flexible hairs. 32
— Rachises with few scales; costæ and costules beneath with many or few long hairs, more rarely glabrescent. 33
32. Scales of rachises of two kinds: some castaneous, lanceolate, rigid, others smaller, thinner, reddish and appressed; under surface almost or quite glabrous. 332. *D. squamosissima* (Sod.) C. Chr.
— Scales of rachises all castaneous, lanceolate; under surface pubescent. 333. *D. mollicoma* n. sp.
33. Andine-West-Indian species, generally densely long hairy. 34
— Species of Juan Fernandez; long hairs rather few, deciduous, leaving raised red spots when falling. 331. *D. inaequalifolia* (Colla) C. Chr.
34. Scales of rachis and costæ ovate, entire, appressed. 330. *D. pansamalensis* n. sp.
— Scales of rachis and costules narrow, toothed, generally concealed between the long hairs which in some forms are few, in others very numerous, deciduous, generally leaving red spots when falling; very large species, often arborescent. 334. *D. Karsteniana* (Kl.) Hieron.
35. Under surface shortly puberulous without long hairs, eglandulose. 36
— Under surface pubescent by short and long hairs intermixed, glandulose; lamina dark green. 341. *D. Wacketii* Ros. n. sp.
36. Scales of costæ and costulæ beneath rather many, broad-ovate, bright-brown; lamina firm, often shining. 339. *D. macrosora* (Fée) C. Chr.
— Scales of costæ beneath very few, lanceolate, toothed; lamina not shining. 340. *D. abundans* Ros.
37. Rachis with rather many large castaneous scales; exindusiate specimens of 347. *D. villosula* n. sp.
— Rachises with few, small scales. 38
38. Lamina dark green, with long hairs beneath; scales fuscous. 341. *D. Wacketii* Ros. n. sp.
— Lamina bright green, shortly glanduloso-pubescent; scales bright brown; sori with fugacious indusia. 342. *D. adenopteris* n. sp.
39. Andine-West-Indian species. Scales of costules lanceolate. 40
— South-Brazilian species, shortly puberulous beneath sometimes glandulose; scales of costules reddish brown, ovate with bullate base. 348. *D. crenulans* (Fée) C. Chr.
40. Sori confined to the upper third of the tertiary pinnules. 346. *D. acrosora* Hieron.
— Sori not so 41
41. Lamina scarcely 1 m long, ovate or ovate-deltoid; scales of rachises and costules conspicuous, castaneous, firm. Andine species. 42

41. Lamina up to 2 m long, deltoid; scales of costæ and costules inconspicuous, yellowish brown, generally hidden between the long hairs. Very large species of Jamaica and Sto. Domingo. 344. *D. villosa* (L.) O. Ktze.
42. Under surface not glandular, densely long hairy. 345. *D. andicola* n. sp.
— Under surface glandular and short-pubescent. 347. *D. villosula* n. sp.

320. **Dryopteris biserialis** (Bak.) C. Chr.; Mon. Dryopteris **1:** 111 nr. 52.
Additional synonym: *Dryopteris Wolfii* Hieron. Hedwigia **46:** 344 tab. 7 fig. 17. 1907.
Ecuador, Stübel nr. 770, 919, 998 (B!).

In the first part of this monograph mentioned as dubious under *Eudryopteris*. Having now examined the original specimens of *D. Wolfii* I find no differences between them and *D. biserialis* (Bak.).

321. **Dryopteris macrotheca** (Fée) C. Chr. Ind. Suppl. 35. 1913. — Fig. 12.
Syn. *Phegopteris macrotheca* Fée, 11. mém. 56. 1866.
Polypodium Mazei Bak. Ann. of Bot. **5:** 457. 1891.
Dryopteris Mazei C. Chr. Ind. 277. 1905.
Type from Guadeloupe, leg. L'Herminier 1864 (Hb. Cosson, Paris!) and later collected by Mazé nr. 643, 786 (B, Kew = *P. Mazei* Bak.) and Père Duss nr. 4109 (W).

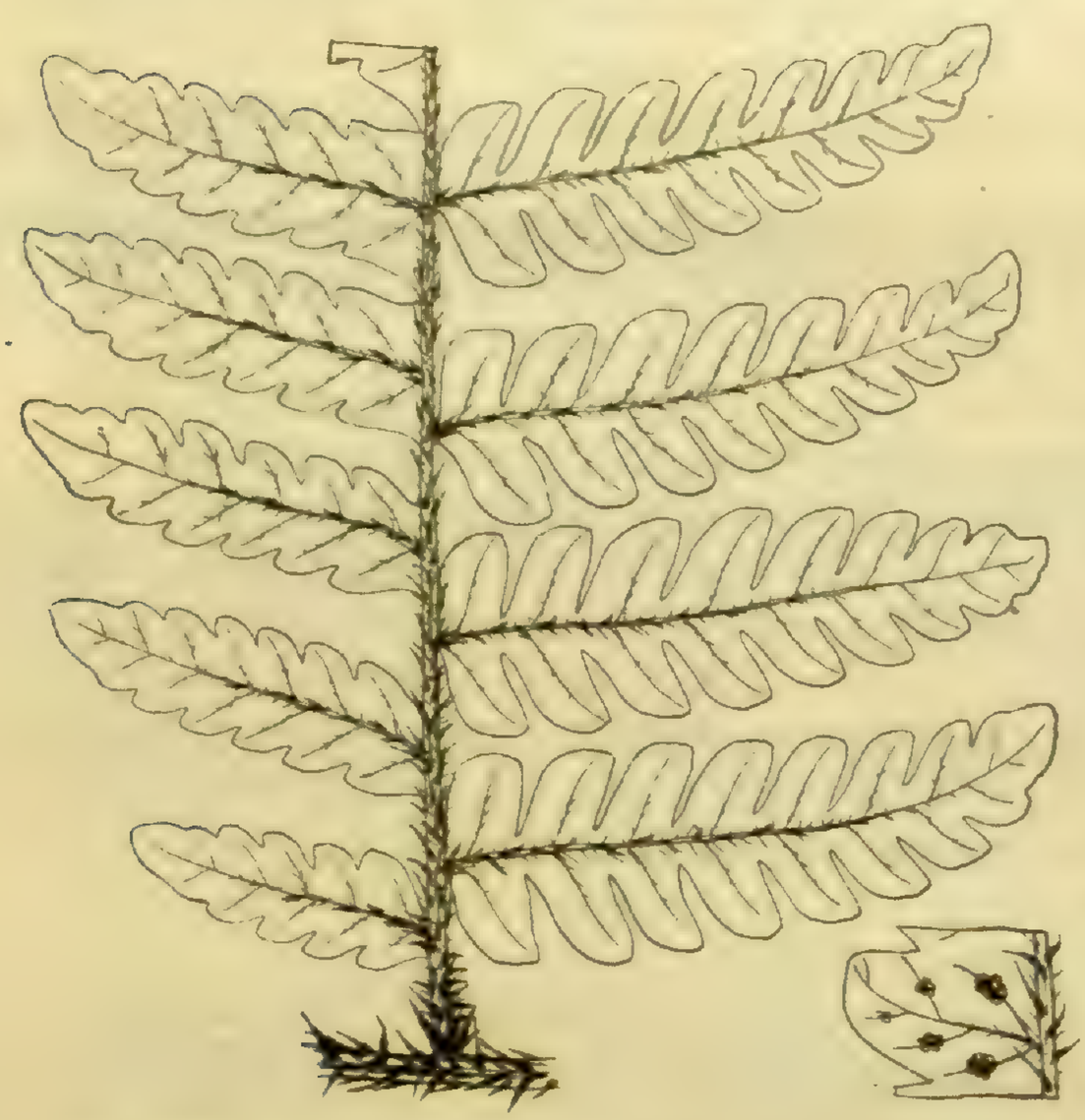

Fig. 12. *D. macrotheca* (Fée) C. Chr. Basal part of a lower pinna, nat. size, and lobe of less incised pinnula, × 2.

A very distinct and rare species, presumably endemic in Guadeloupe and not to compare with any West Indian species, but closely related to the Andine *D. biserialis;* it is more divided and pubescence different. — The up to 35 cm long stipe is, like the rachis, purplish-black and densely scaly throughout by rigid, castaneous, lanceolate, entire scales; the costæ beneath with numerous similar smaller scales. Lamina up to 50 cm long, ovate, bipinnate below, deeply bipinnatifid upwards. Basal pinnæ with the lower side somewhat produced; the basal basiscop pinnula is often a little shorter than the second; the basal acroscopic pinnula somewhat reduced. Pinnæ about 15 cm long,

6 cm broad, acuminate, short-stalked, pinnatifid nearly or quite to the costa into broadly adnate, contiguous, arcuate, obtuse or subacute pinnulæ, $2^1/_2$—3 cm long, 1 cm broad, crenate or the larger ones somewhat lobed. Costæ and costulæ above antrorsely strigose with long, articulated hairs, beneath shorter and more softly pubescent with whitish hairs; margins sparsely ciliate, leaf-tissue of both surface sglabrous. Lateral veins in 6—8 distant pairs, forked or subpinnate, not reaching the edge, terminating in a distinct hydathode. Sori in 1—2 rows on each side of the midrib, exindusiate. Sporangia dark-brown.

324. **Dryopteris subincisa** (Willd.) Urban, Symb. Antill. **4**: 19. 1903; C. Chr. Ind. 295 (excl. subsp.) — Fig. 13.

Syn. *Polypodium subincisum* Willd. sp. **5**: 202. 1810; Klf. Flora **1823**: 364.
Phegopteris subincisa Fée, Gen. 243. 1852; Mett. Fil. Lechl. **2**: 27.
Nephrodium villosum var. *subincisum* Jenm. Bull. bot. Dept. Jam. n. s. **3**: 114. 1896.
Aspidium subincisum Christ, Bull. l'Herb. Boiss. II. **6**: 56. 1906.
Phegopteris spectabilis Mett. Fil. Hort. Lips. 83 tab. 17 fig. 10. 1856.
Polypodium spectabile Hook. sp. **4**: 259. 1862 (non Kaulf.)
Polypodium caribaeum Desv. Berl. Mag. **5**: 319. 1811.
Alsophila martinicensis Spr. Neue Entdeck. **3**: 7. 1822.
Phegopteris martinicensis Fourn. Mex. Pl. **1**: 90. 1872.
Polypodium Galeottii Martens; Mart. & Gal. Foug. Mex. 43 tab. 7 fig. 3. 1842.
Phegopteris Galeottii Fée, Gen. 243. 1852; A. Br.; Mett. Fil. Lechl. **2**: 26.
Dryopteris Galeottii C. Chr. Ind. 267. 1905; Hieron. Hedwigia **46**: 349.
Polypodium Sloanei Liebm. Vid. Selsk. Skr. V. **1**: 207 (seors. 55). 1849.
Phegopteris epierioides Fée, Gen. 248. 1852 (non Cr. vasc. Br. **1**: 104).
Phegopteris stenolepis (stenolepsis ex err.) Fée, 8, mém. 89. 1857 (t. Fourn.).
Aspidium Araguata (Moritz) Reichardt, Denkschr. Ak. Wien 17^2: 38 tab. 2 fig. 28—31. 1859.
Phegopteris dilatata Fée, 11. mém. 52 tab. 14 fig. 1. 1866.
Polypodium connexum Bomm. et Christ, Bull. Soc. bot. Belg. **35**: 216. 1896.
Phegopteris connexa Christ, Prim. Fl. Costarr. **3**: 36. 1901.
Dryopteris Gilberti Clute, Fern Bull. **8**: 67. 1900 ex descr.
Type from Venezuela: Caracas, leg. BREDEMEYER (Herb. Willd. nr. 19701. B!).

I give a detailed description of this species, which is the most common of a group of closely allied species. My description is drawn up chiefly after the original specimen that consists of an upper and a lower part of a pinna (the same?) and after complete leaves, which exactly agree with the type-specimen.

Caudex not seen, said to be erect, stout, with long, castaneous scales at the crown, somewhat epigæous. Stipe 50 cm or more long, up to $1^1/_2$ cm thick, terete, channelled above, fuscous, or brownish-stramineous, at base densely, upwards gradually less scaly. Scales 1—3 cm long, castaneous, glossy, linear-lanceolate, long

acuminated, rather stiff but fragile, sharply toothed. Lamina probably up to 2 m long, dark green, membranous, deltoid or ovate-deltoid, quadripinnatifid below, tripinnatifid at the middle. Pinnæ subopposite, at distances of 8—10 cm, the basal ones the largest, perhaps up to 1 m long on stalks 3—4 cm, with the lower side produced. Middle pinnæ short-stalked, lanceolate-oblong, acuminate. Secondary pinnulæ at nearly right angles to the costa, at distances of 2 cm, the lower pairs shortly petiolate, the middle sessile, the upper ones adnate to costa at the posterior base, the uppermost ones decurrent, at least confluent, a middle pinnula oblong, acuminate 8—10 cm long, 2—2½ cm broad, pinnatifid nearly to the midrib. Tertiary segments close, nearly contiguous, separated by narrow, acute sinuses, 4—5 mm broad, the edges nearly parallel from base to apex that is bluntly rounded at the posterior side, sometimes truncate or even emarginate, most of them perfectly entire, only the lower ones of the larger pinnulæ being more or less lobed, the lobes falcate; posterior basal segment always somewhat reduced, the anterior one equal to the others. Veins 6—7 jugate, most of them furcate, terminating distinctly within the margin; the tips of veins form an oblong brown spot seen on the upperside (hydathode); midvein of an adnate, posterior segment springs out from the base of the costula or more often from the costa of the pinnæ. — Rachis, costæ and costulæ beneath fibrillose by brown, linear or lanceolate-linear scales, with toothed margins and fimbriate round the cordate base, teeth of margins variable (see below); scales clathrate with thick cell-walls, the cells nearly isodiametrical along the edges, longitudinal at the centre; outer cell-walls yellowish brown, the lumina, therefore, as a rule not clear as in the scales of *D. ampla* and its allies. Rachis above rusty pubescent with articulated *Ctenitis*-hairs, upwards like the costæ above strigose by antrorse, subulate, often characteristically falcate, paucicellular, whitish or brownish, longer hairs. Similar but fewer hairs are found on the midribs of the segments and (more scattered and deciduous) on the veins above and also on the margins, upper surface otherwise glabrous. Costulæ beneath with similar but more patent and soft hairs, often shorter and longer intermixed; pubescence of underside rather variable (see below). — Sori rather small, exindusiate, about medial, on the anterior branch of a furcate vein, a little above the furcation. Spores densely and minutely papillose,

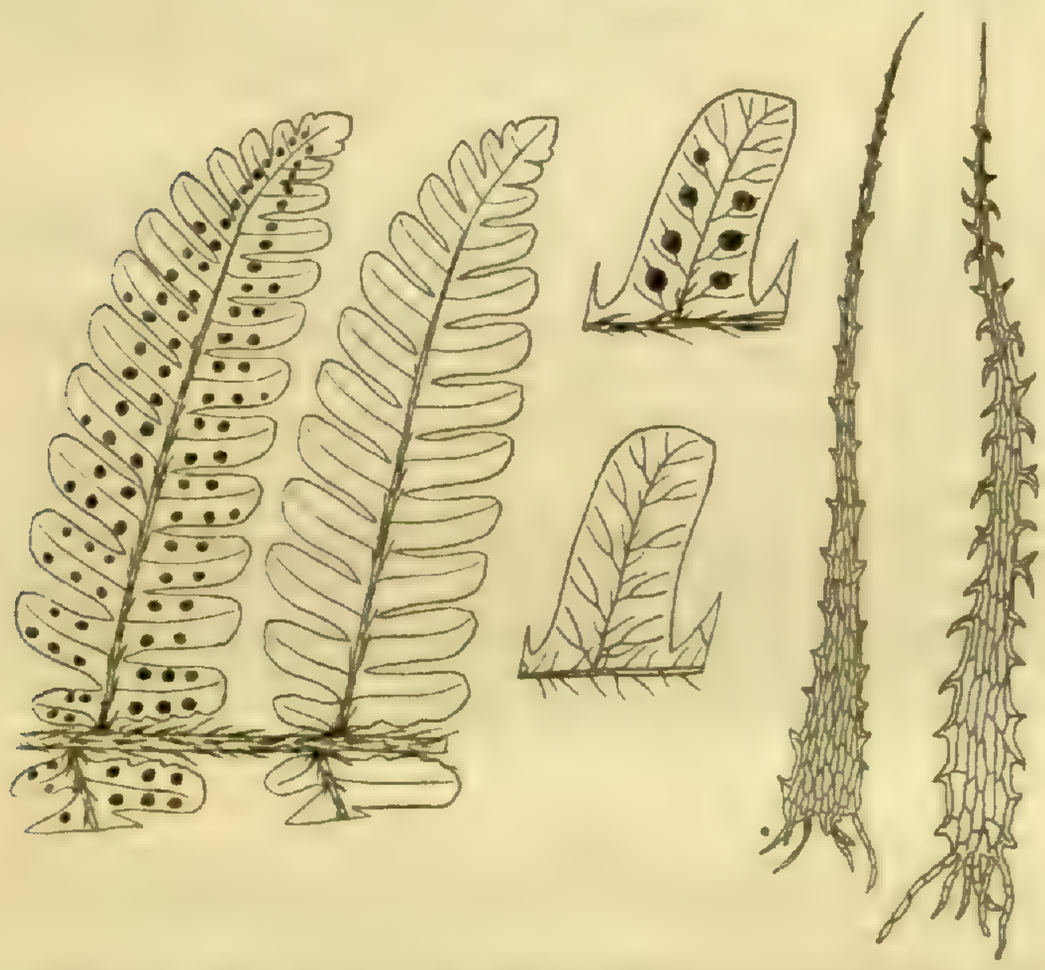

Fig. 13. *Dr. subincisa* (Willd.) Urban. Two secondary pinnulæ, nat. size, and segment seen from both surfaces, × 2; scale (the left-hand one) from costa. All drawn after the type-specimen. The right-hand scale from costa of *f. Galeotti*.

D. subincisa is as to cutting, shape of ultimate segments, colour and texture rather constant, but it varies considerably in size and pubescence. As the above list of synonyms indicates, several authors have described as species a series of forms, which I, however, cannot separate from *D. subincisa*. The scales are always toothed, but the teeth are somewhat different, and METTENIUS (Fil. Lechl.) maintained two species characterized by the teeth of the scales: *Pheg. subincisa* (teeth short, patent, mostly triangular) and *Ph. Galeottii* (teeth long, mostly retrorsely claw-shaped). I cannot consider that character of essential value; specimens from about all localities have both kinds of teeth. Most uniform are the specimens from Mexico, with which the majority of Central-American specimens agree; they have always claw-shaped teeth (*Ph. Galeottii, Pol. Sloanei* Liebm., *Ph. stenolepis* Fée, *Ph. martinicensis* Fourn.). Intermediate forms are described as *Alsophila martinicensis* Syn. and *Pheg. epierioides* Fée, both from the West Indies. The specimens from the Southern Lesser Antilles agree very well with the typical form from the Northern Andes, i. e. they have short-toothed scales.

As to pubescence we find forms from all localities with the underside perfectly glabrous or shortly downy with minute, erect hairs; this variation is probably due to age and perhaps to outer conditions. The rachis and costæ beneath are never shortly puberulent as in *D. vasta*. The most different form seen, with regard to pubescence, is represented by some specimens from Porto Rico, which have the underside finely but rather sparsely glandulose by erect, capitate glands (f. *glandulosa*).

Phegopteris dilatata Fée is a variety from the Lesser Antilles, that is marked by its mostly bright-green leaf with brighter, nearly entire scales and with supramedial sori.

D. subincisa is commonly said to be distributed through tropical America, from Mexico to Argentina, but it inhabits, however, a more restricted area. It is common from Southern Mexico through Central America to Bolivia and it occurs, probably as a rather rare species, on the four larger Antilles; further it is found frequently in the Lesser Antilles from Guadeloupe to Grenada. It is wanting in the Virgin Islands and apparently also in Trinidad and Guyana. No Brazilian specimen seen may properly be referred to *D. subincisa*, and the Chilean plants often referred hereto belong to *D. spectabilis*.

Below I enumerate a number of the very numerous specimens seen, omitting exact localities for Costa Rica, where the species is very common.

Lesser Antilles: Grenada, EGGERS nr. 6116 b (B), 6144 (B, RB), 6213 (B, RB, W); SHERRING nr. 102 (B, W); BROADWAY nr. 1860 (B), 3765, 3781 (RB) Obs. All these specimens fall rather under *Pheg. dilatata* Fée) — St. Vincent; EGGERS nr. 6868 (B, R, RB, W); H. H. & G. W. SMITH nr. 292 (B, RB) (all the typical form). — Martinique, SIEBER: Syn. Fil. exs. nr. 162, Fl. Mart. nr. 348 (B, RB — type of *Alsophila martinicensis* Spr.); HAHN nr. 552 (B, RB), Père DUSS nr. 1559, 4124 (B), 1562 (RB), 1581 b (B, W) — Guadeloupe, L'HERMINIER (B, RB — type of *Pheg. dilatata* Fée), MAZÉ nr. 249 (B); Père DUSS nr. 4034, 4109 b (W), 4340 (B, W).

Porto Rico: SINTENIS nr. 1371 (B), 4570 (B, RB, S, W); GUNDLACH nr. 1372 (B), A. A. HELLER s. n. (W); HIORAM s. n. (CC, R, RB, W = f. *glandulosa*).

Jamaica: Hart nr. 40, 115 b (W), Day nr. 127 (B, RB), Clute nr. 132 (W), Underwood nr. 415 (W), Maxon nr. 1041 (W = Underwood nr. 2164), Harris nr. 7199 (B).

Sto. Domingo: Haïti, Weinland nr. 3 (B); near Barahona, v. Türckheim nr. 2719 (B), Fuertes nr. 741 b, 1548 b, 1564 (B).

Cuba: near Monte Verde, Wright nr. 1012 (B, CC, S, W): Santa Ana, Yateras, Maxon nr. 4202 (W). Linden nr. 282, 412 (fragm. in B = *Pheg. epireioides* Fée).

Mexico: Vera Cruz: Mirador, Liebmann nr. 2668, 2670 (H): H. Ross nr. 672 (CC), Huatemalco, Liebmann nr. 2669 (H), Hacienda de Jovo, Liebmann nr. 2671 (H): Cordova, Bourgeau nr. 2016 (S, W), 2277 (H), H. Fink nr. 55, 59, 145 (W), C. Conzatti nr. 594 (RB) — Zacuapan, Purpus nr. 1980 pt. (W), 4254 (W), 4254 a (B), 4342 (W) — Chiapas, between Carmen and Solosuchiapa, Collins & Doyle nr. 234 (W).

Guatemala: Alta Verapaz, v. Türckheim ed. J. D. S. nr. 1056 (B, W — distr. as *Nephrodium villosum* Pr.), 8052 (B, RB), 8811 (W — both distr. as *Nephr. catocarpum* Hook.); v. Türckheim nr. II. 1069 (RB); near Sepacuité, Cook & Doyle nr. 329 (W).

Nicaragua: Cañada Yasica, E. Rothschuh nr. 213 (B).

Costa Rica: Specimens distributed by *Herb. Inst. phys. geogr. Costarric.*: Pittier nr. 4185 (B, W), 4187 (W), 7210 = 9909 (W), 12364 (RB, W): Tonduz nr. 1838, 9472 (W), 9481 (RB, W), 9868 (B, W), 11334 (RB), 14583 (W); Cooper nr. 10271 (RB, W), P. Biolley nr. 10686 (RB), 10687 (W), Alfaro nr. 16470, 16552 (RB) and ed. J. D. S. nr. 8076 (B, W), Wercklé nr. 16740,16767 (CC, RB, W) — Donn. Smith nr. 6893 (W), 6895 (B, W — distr. as *Pol. connexum* Klf.); O. Jiménez nr. 577 (W), 808, 891, 897 (RB); C. Hoffmann nr. 205 (B); Cook & Doyle nr. 151 (W); Maxon nr. 303 (W); B. Brade nr. 215 (R).

Panama: Chiriqui, Maxon (nr. 4952 (CC, W).

Colombia: Santa Marta, H. H. Smith nr. 1023 (RB), 1047 (B, Rg, RB, W).

Venezuela: Caracas, E. Otto nr. 603, 867 (B), Caripe, Moritz nr. 202 (B, H, RB = *P. Araguato* Moritz), Tovar, Moritz nr. 385 pt., 389 (B), Karsten s. n. (B, RB), Fendler nr. 202 (B); Margarita Island, J. R. Johnston nr. 187 (B, H, S, W); Merida, Funck & Schlim nr. 492 (B), 1575 (L).

Ecuador: Pastaza-valley, Stübel nr. 943 (= *D. Galeottii* Hieron. Hedw. **46**: 349) Spruce nr. 5262 (L, Budapest).

Bolivia: Antahuacana, O. Buchtien nr. 2192, 2228 (R).

Paraguay: Sierra de Amambay, Rojas ed. Hassler nr. 10802 (B — rather doubtful).

Besides numerous specimens from cultivated plants, among them the original specimens of *Pheg. spectabilis* Mett. and *Ph. Galeottii* A. Br. (B).

325. **Dryopteris vasta** (Kze.) Hieron. Hedwigia **46**: 347. 1907. C. Chr. Ind. Suppl. 41.

Syn. *Polypodium vastum* Kunze, Linnaea **9**: 50, 1834.
Phegopteris vasta Mett. Fil. Lechl. II. 27. 1859.
Dryopteris subincisa **vasta* C. Chr. Ind. 295. 1905.
? *Polypodium extensum* Pr. Rel. Haenk. **1**: 26. 1825 (non Forst. 1786).
? *Nephrodium polylepis* Sod. Cr. vasc. quit. 260. 1893.
Dryopteris fusca C. Chr. Ind. 267. 1905.
Type from Peru, leg. Poeppig (cotype in B!).

Closely allied to *D. subincisa*, and it might as well be treated as a variety of that species. It differs mainly in pubescence. Rachis, costæ and costulæ beneath

are finely and often densely puberulous with short hairs, while long hairs in typical forms are lacking; both surfaces are more or less finely downy, which gives the lamina a greyish appearance. The scales are about as those of typical *D. subincisa*, i. e. shortly toothed, and in size and cutting I find no essential difference between the two species.

P. extensum Pr. is according to a note in B. this species; PRESL's name is the oldest, but is invalidated by *P. extensum* Forst. *Nephr. polylepis* may according to the description be this species; I have seen no authentical specimen.

Peru near Pampayaco, POEPPIG (B); Tarapoto, SPRUCE nr. 4718 (Kew, RB — a form with some longer hairs between the shorter ones).
Bolivia: Polo-Polo bei Coroico, Nordyungas, BUCHTIEN nr. 3588, 3609 (R).
Ecuador: near San Florencio, STÜBEL nr. 788 (B); SODIRO (RB).
Colombia: Coteje am Rio Timbiqui, LEHMANN nr. 8924 (B); Las Juntas, STÜBEL nr. 19, 24, 24 a (B).
Costa Rica: Cañas Gardas, PITTIER nr. 10993 (RB, W); Palma, C. BRADE nr. 215 (R); Finca Gebr. Hundrisser C. BRADE nr. 404 (R); Chilamate, PITTIER nr. 7480? (B, W).
Paraguay: Sierra de Amambay, ROJAS ed. HASSLER nr. 10421 (RB).

326. **Dryopteris spectabilis** (Kaulf.) C. Chr. comb. nov. — Fig 14.

Syn. *Polypodium spectabile* Kaulf. Enum. 121. 1824.
Phegopteris spectabilis Fée, Gen. 243. 1852 (non Cr. vasc. Br. **1**: 103), Mett. Fil. Lechl. I. 19, II. 26 (non Fil. Hort. Lips. 83 nec Pheg. 30 nr. 62).

Type from Chile, leg. CHAMISSO (not seen; on a label to POEPPIG nr. 137 METTENIUS has written: exacte congruit cum h. Kaulf. 886, 887, and I think, therefore, that the specimen leg. POEPPIG is typical).

Differs from the other species allied to *D. subincisa* by its castaneous, lanceolate, firm and fragile scales that are quite entire or finely toothed towards the apex only, by its firm, chartaceous texture and greyish-green colour and by the basal anterior tertiary segments being broader and a little longer than the following ones, while the posterior ones are somewhat reduced. The midvein of a posterior basal segment that is broadly adnate to the costa and sometimes very narrrowly adnate to the costule, springs out from the costa about 2 mm from the base of the costule. In pubescence the species scarcely differs from *D. vasta*. Stipe, rachis, costæ, costules and veins beneath are shortly greyish puberulous, the leaf-tissue of the under-side more or less minutely downy, midribs and veins above antrorsely and shortly strigose; the upperside otherwise nearly glabrous, the margins ciliate. Sori rather small, 4—10 to each tertiary segment, medial. — Longest pinnæ seen about 30 cm long; the pinnules are shortly acuminate or acute and the segments are generally all entire or faintly crenate.

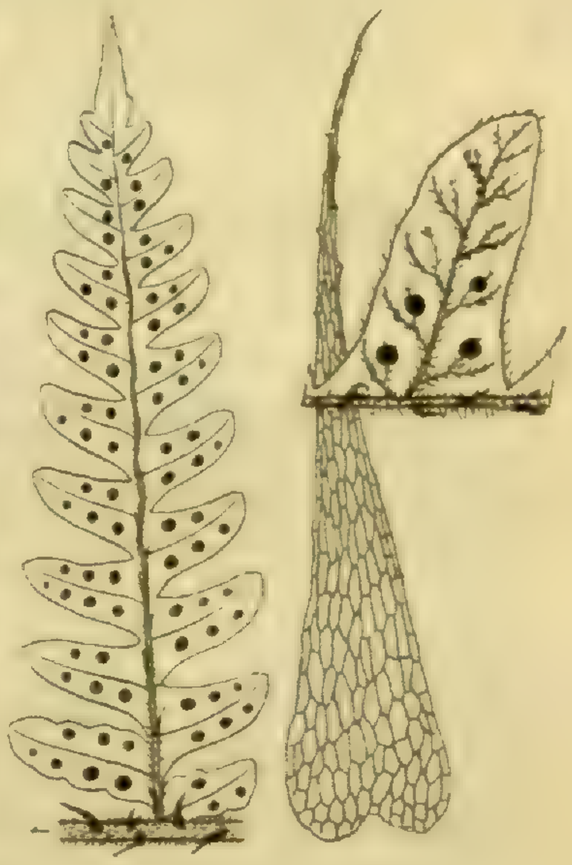

Fig. 14. *D. spectabilis* (Klf.) C. Chr. Secondary pinnula, nat. size; segment × 2 and scale from costa.

Chile: in sylvis ad Talcahuano, Poeppig nr. II. 137 (B); prope Corral, Valdivia. Lechler nr. 501 (S, U); R. M. Middleton (Rg); Buchtien (Budapest).

West Patagonia: Aysén-valley, Dusén (Rg, S).

The following variety is probably a form from more exposed localities; no doubt it is not specifically different.

var. **Phillippiana** nom. nov.

Syn. *Phegopteris vestita* Philippi Linnaea **29**: 107. 1857.
Polypodium vestitum Hook. sp. **4**: 271. 1862 (non alior.).
Dryopteris subincisa **vestita* C. Chr. Ind. 296. 1905 (the name *vestita* has been used for several other dryopteroid ferns and it seems appropriate to use another name here).

Smaller than the type and more firm in texture, often coriaceous. Scales of stipe, rachis and costæ beneath more numerous, and all vascular parts beneath with several, often many, long, subulate, whitish hairs intermixed with shorter hairs.

Chile: Valdivia, Krause (H); Chiloë, near mouth of Rio Pudeto, Skottsberg (U).

With *D. spectabilis* the genus *Dryopteris* reaches its farthest south in America, it is the only species that occurs in temperate South America.

327. **Dryopteris hirsuto-setosa** Hieron.; C. Chr. Mon. I. no. 53.

As mentioned in the first part of this monograph this species must naturally be consociated with the other long hairy species of the present group; it is scarcely more than bipinnate and apparently scaleless, but its long pluricellular hairs are of the same structure as those of the following species. — Ecuador.

328. **Dryopteris atrogrisea** n. sp. — Fig. 15.

Syn. *Aspidium Karstenianum* var. *Navarrense* Christ, Bull. l'Herb. Boiss. II. **6**: 56. 1906 (non *Dryopteris navarrensis* Christ 1907; *Aspidium* Christ 1906).
Type from Costa Rica: Tablazo, leg. P. Biolley no. 70 (CC).

Species inter vicinas minor, pubescentia *D. villosae* ac *D. acrosorae* similis, exindusiata. — Rhizomate erecto, cum basin stipitum squamis numerosis, linearibus, castaneis, nitidis, minute et dense dentatis vestito. Stipite 15—25 cm longo, sursum ut rachi sparsim squamosa, verrucosa; rachi sursum pilis albis molliter hirta. Lamina late ovata, 25—45 cm longa, firmiter herbacea, superne atroviridi, inferne grisea, tripinnatifida. Pinnis remotis (internodiis usque ad 10 cm longis), basalibus deorsum auctis, sequentibus subaequilongis vel paulo brevioribus; medialibus ca. 15 cm longis, 6 cm latis, oblongis, acuminatis, stipitatis. Pinnulis fere omnibus sessilibus, superioribus postice late adnatis, supremis decurrentibus, medialibus oblongis, 3 cm longis, 8—10 mm latis, acutis vel subobtusis, fere ad costulam pinnatifidis. Laciniis 8—10-jugis, oblongis, 3 mm latis, obtusis vel oblique acutis, basali posteriore pinnularum superiorum ad costam late adnata, lata breviore. Venis parum conspicuis, indivisis,

4-jugis, marginem non attingentibus, mediani laciniae basalis posterioris e basi vel interdum supra basin costulae exeunte. Costis costulisque superne antrorsim strigosis et venis setis nonnullis deciduis sparse instructis, parenchymate paginae superioris glabra; marginibus ciliatis; pagina inferiore ubique, imprimis ad costas costulasque pilis albidis patentibus (ad parenchyma erectis) longioribus brevioribus intermixtis dense pubescente. Costis squamis parvis, fuscis, minute dentatis, lanceolatis, inter pubescentiam plerumque occultis, sparse onustis. Soris inframedialibus, exindusiatis; sporangiis laxe coacervatis.

This is certainly a most distinct species, different from *D. Karsteniana*, to which CHRIST referred it as a variety, by its much smaller size and dark-green colour. In pubescence it comes next to *D. villosa*, in scales to *D. subincisa*. The rachis has small raised points but is not red-spotted as several other species of the group.

Costa Rica: Tablazo, P. BIOLLEY nr. 70 (CC, RB, W); ibid. C. BRADE nr. 27 (R); Navarro, WERCKLÉ (CC, R, RB, W); Carpintera, C. BRADE (R).

329. Dryopteris lunensis (Christ) C. Chr. Ind. Fil. Suppl. 35. 1913.

Syn. *Aspidium lunense* Christ, Bull. l'Herb. Boiss. II. 6: 55. 1906.

Type from Costa Rica: Luna, l. WERCKLÉ (auth. specimen in W, the only seen).

Stipe (soon glabrescent), rachis and costæ beneath densely rufous-tomentose by short, articulated hairs and clothed with bright-brown, thin, entire, ovate-lanceolate, mostly appressed scales, which are particularly numerous on the costæ; basal scales darker and stiffer. Lamina subcoriaceous, bright-brown when dried, ovate, about 50 cm long, quadri-tripinnatifid. Pinnæ 10—15 cm long, acuminate. Pinnules patent, oblong, obtuse or shortly acute, 3—4 cm long, 1 cm broad, sessile, the upper adnate-decurrent, pinnatifid nearly to the costula into oblong, close tertiary segments, the apex of which is rounded behind. A posterior basal segment of an upper pinnula is broadly adnate to the costa with the midvein springing out from

Fig. 15. *D. atrogrisea* C. Chr. Apex of a pinna, nat. size; base of a superior secondary pinnula, × 2.

it. Costæ and costulæ above antrorsely strigose and the veins with scattered setæ, the margins ciliated; costæ, costulæ and veins beneath densely and shortly tomentose partly by short *Ctenitis*-hairs, partly by some slender and somewhat longer hairs, and scaly; leaf-tissue of under-surface densely and minutely downy by short, erect hairs. Sori small, exindusiate.

By its bright-brown, thin scales this species resembles *D. ampla*, but the whole structure of the frond shows that its real affinity is to species of the group of *D. subincisa*. It differs from all andine species of that group by its bright-brown scales; in pubescence and scales of the rachis it is similar to *D. squamosissima*, but it lacks the rigid, castaneous scales and it is much smaller. It comes near to *D. atrogrisea* in size and cutting, but differs in colour and pubescence. — Christ referred to this species two specimens, one from Pont du Navarro, the rhizome of which was described by the collector »comme rampant et entortillé à l'égal de *Pteridium*«, the other from Luna, which is described as »semi-arborescente«. It is clear that those two specimens must be two quite different things; the former is unknown to me.

Dryopteris vasta var. *bogotensis* Hieron. Hedwigia **46:** 347. 1907 from Colombia: Bogotá, Stübel nr. 434 (B) is a critical form much resembling *D. lunensis* in size, colour and bright scales, but the scales of the rachis are finely toothed and the underside nearly glabrous; still there are traces of a tomentum, and it seems better to place this fern provisionally under *D. lunensis* as a variety than under *D. vasta*.

330. Dryopteris pansamalensis n. sp.

Similis formae minori *D. villosae*, exindusiata, paleis basalibus ovatis, integerrimis, pubescentia densiore. Habitu *D. atrogriseae* similis, differt: paleis valde diversis, pilis numerosioribus, omnibus longis, articulatis, soris medialibus vel supramedialibus.

This new species is no doubt a near ally of *D. villosa;* it is smaller and apparently exindusiate. In general habit it is very similar to *D. atrogrisea*, from which it differs clearly by its broad, entire, brighter scales and the more numerous and longer hairs; the hairs of the upperside are rather many and not confined to the veins. As a whole it is more long-hairy than any other species of the group. Pinnæ of largest specimen seen 35 cm long; pinnules broadly obtuse with 6—8 subentire segments to each side; those of the largest specimen acuminate with about 15 pairs of tertiary, broadly obtuse segment, the lower of which are again pinnatifid. The posterior basal segment of the upper pinnules are adnate with their whole base to the costa, and their midvein springs out from the costa up to 2 mm from the base of the costula.

Although the specimens referred here are different in size and degree of division, they no doubt all belong to the same species. The smaller specimens (nr.

1055) are cut exactly as *D. atrogrisea*, the larger ones (no. 3268 a) are cut once more, the larger tertiary segments being exactly similar to the secondary ones of the smaller form.

Guatemala: Pansamalá, Dept. Alta Verapaz, v. Türckheim ed. Donn. Smith nr. 1055 (W, type-specimen distr. as *Nephrodium villosum* Pr?); between Sepaquité and Secanquim, Maxon et Hay nr. 3268 a (W).

331. **Dryopteris inaequalifolia** (Colla) C. Chr. comb. nov.

Syn. *Polypodium inaequalifolium* Colla, Mem. Acad. Turino **36**: 49. 1836.
Polypodium Berteroanum Hook. sp. fil. 4: 269. 1862 (excl. specimens from the continent, not Spr. 1827).
Dryopteris subincisa **Berteroana* C. Chr. Ind. 296. 1905.
Nephrodium villosum Hemsley, Challenger Exp. Bot. part. III: 75.
Dryopteris villosa var. *Berteroana* C. Chr. Ark. f. Bot. **10**[2]: 13. 1910.
Dryopteris Skottsbergii C. Chr. *supra* p. 15.

Type from Juan Fernandez, leg. Bertero nr. 1550 et 1660; fragments from Budapest!

Hooker's name for this species being invalidated by an older name I renamed it *D. Skottsbergii* in honour of Prof. Carl Skottsberg who has contributed largely to our knowledge of the vegetation of temperate South America and Juan Fernandez and who has collected, during his exploration of the islands in 1916—1917, a very beautiful lot of specimens of the fern in question. While studying in detail his unique collection of ferns from Juan Fernandez — and while reading the proofs of the present work — I found that the hitherto unidentified *Polypodium inaequalifolium* Colla described from a basal pinna is just my *D. Skottsbergii*; that my identification is right is further confirmed by two fragments from Bertero's original collection received from Prof. Kümmerle, which are labelled *Polypodium an n. sp.*?, just as quoted by Colla. My proposed name *D. Skottsbergii* must, therefore, be stopped.

D. inaequalifolia reaches a total height of more than 2 meters; some individuals have an epigeous caudex nearly 1 meter high bearing at its top a dense crown of leaves, 1 m or more long. Basal scales blackish castaneous, thick, entire, lanceolate, 2 cm or more long. Stipe and rachises stramineous with few similar but much smaller scales, not rarely nearly quite naked. Lamina ovate-deltoid, the largest pinnæ seen 50 cm long, 25 cm broad, firm, sometimes subcoriaceous, fresh-green, when dried brownish, in cutting varying from tripinnatifid to quadripinnatifid. Lower tertiary pinnules quite free, the middle and upper ones sessile and decurrent, oblong, 1.5—2 cm long, 4—8 mm broad, oblique, subacute, the basal anterior one slightly or not produced, the posterior scarcely reduced, nearly all deeply lobed into close, broad, acute or subacute lobes. Veins immersed and obscure; midvein of an adnate basal posterior segment of an upper pinnula springs out from the costa about 2 mm from the base of the costula.

The species differs from all allied species by 1) its scales of the costules beneath, which are few or rather many, fulvous or fuscous, broadly ovate, entire, 2) in its pubescence: short hairs absent throughout, but rachis and specially costæ, costulæ and midribs beneath with often many long, soft, articulated hairs, which when falling leave red, a little elevated spots on the rachises; costæ and costulæ above antrorsely strigose, the margins ciliated, surfaces otherwise glabrous and eglandulose, 3) in its sori which are a little supramedial, at maturity covering the whole under surface with a dense mass of sporangia, without a true indusium, but at the centre with a tuft of long, articulated hairs from the receptacle.

In general habit our species resembles closely *D. subnicisa*, in pubescence it comes nearer to the more glabrescent forms of *D. Karsteniana*, but its costulae scales and long hairy receptacles mark it clearly. Old leaves are often quite glabrous, the hairs being early falling, leaving red spots such as are also seen in some forms of *D. Karsteniana*. The typical form is apparently confined to the island of Masatierra, and the species is, as far as known, endemic in the islands.

Juan Fernandez: Masatierra, common, SCHEID (R), SKOTTSBERG 1908 nr. 730, 731 bis (CC, U) 1916—1917: nr. 65, 168, 274, 274 b, 275, 339, 604, 1151, 1152 (Herb. SKOTTSBERG).

In the island of Masafuera the species seems to be growing in a single locality only, and the specimens from that island are somewhat different in pubescence. This form may be named.

var. **glabrior** C. Chr. et Skottsb. n. var.

Large, dark-green, nearly quite glabrous, receptacles glabrous or sometimes with 1—2 shorter hairs.

Juan Fernandez: Masafuera, in the inner of Quebrada de las Casas, SKOTTSBERG 1908 nr. 731 (CC, U, 1917 nr. 446.

332. **Dryopteris squamosissima** (Sodiro) C. Chr. Ind. 294. 1905. — Fig. 16.

Syn. *Nephrodium squamosissimum* Sodiro, Cr. vasc. quit. 256. 1893.

Type from Ecuador: Cerro El Altar, province of Chimborazo, leg. SODIRO (not seen).

Having seen no authentical specimen it is, of course, somewhat uncertain, whether the species here described under SODIRO's name really is identical with his species, still the specimen here considered the type of my species, viz. SPRUCE no. 5252 (H), agree well with SODIRO's description, and it seems better to use his name for it than to create a new name that later on probably will be shown to be a synonym. I have seen some pinnæ and parts of the rachis only.

D. squamosissima is, as here understood, the most developed species of all that are allied to *D. subincisa*, and it is specially well marked by its densely scaly primary and secondary rachises. Rachis about 1 cm. thick, densely coated with a double layer of scales and tomentum. Scales large $1^1/_2$—2 cm long, $1^1/_2$—2 mm broad, lanceolate-acuminate, castaneous, glossy, very shortly toothed or subentire

rather thick and fragile, under these larger scales the rachis is densely rufous- and adpressedly tomentose partly with articulated hairs, partly with small, reddish scales. Secondary rachises similarly scaly and tomentose, while the costulæ and midveins beneath are rather densely clothed with reddish, small scales, without large, castaneous ones and without hairs. Pinnæ 40—60 cm long; pinnulæ distant, not touching each other, oblong-acuminate, up to 10 cm long, 2—3 cm broad, sessile or nearly so, the uppermost ones adnate and shortly decurrent, incised nearly or quite to the costula. Tertiary segments or pinnulæ, adnate and delated equally to both sides of the base, obtuse or shortly acute, 2—2½ cm long, 5—8 mm wide, the sinus between them triangular, acute, upwards with a broad open space about as broad as the segments; margins regularly and shallowly lobed or serrulate. Veins simple or forked with the thickened apex terminating within the margin; the midrib of a posterior adnate segment of an upper pinnula springs out from the costa 2—3 mm from the costula. Costulæ above antrorsely strigose and the margins shortly ciliate, both surfaces otherwise perfectly without hairs. Sori rather large, a little inframedial, exindusiate.

Evidently a very large species and one of the most distinct of the whole group, well marked by its two kinds of scales, its distant pinnulæ, the dilated base of the tertiary segments and the absence of hairs of any kind of the underside.

Ecuador, without locality, Spruce nr. 5262 (H); near Tunguragua, Stübel nr. 839 a (B).

Colombia, without locality, Triana (W); Manganos, Lindig nr. 331 (B).

var. **bogotensis** (Hieron.)

Syn. *Dryopteris subincisa* var. *bogotensis* Hieron. Hedwigia 46: 349. 1907.

Primary and secondary rachises less scaly, the scales more toothed, and nearly without tomentum. The two specimens examined are, however, from old leaves, and it is probable that scales as well as tomentum are lost, so that the specimens really belong to the true species.

Colombia: Bogotá, Stübel nr. 418, 423 (B).

333. **Dryopteris mollicoma** n. sp.

Type from Ecuador: in silv. subband. orient. Oyacachi, leg. Sodiro 1901 (RB); another specimen from Mt. Corazon, Sodiro no. 145 (Budapest).

Fig. 16. *D. squamosissima* Sod.) C. Chr. Secondary pinnula, nat. size, and tertiary pinnules. × 2.

Species *D. squamosissimae* (Sod.) C. Chr. proxime affinis, divisione, textura, colore, rachibus dense paleaceis cum eadem congruens, differt autem paleis omnibus rigidis, lanceolatis, castaneis, integerrimis, parvioribus rufescentibus deficientibus, lamina utrinque dense et molliter longe pilosa, soris medialibus.

This is in general habit and shape of tertiary pinnules scarcely to be distinguished from *D. squamosissima*, but it differs considerably in pubescence. The strong stipe is throughout like the primary and secondary rachises especially towards the base densely paleaceous by black-brown, rigid, fully entire, lanceolate scales, the largest of which are 3 cm long 3 mm broad; all the larger scales are patent, but under them are found some smaller but also lanceolate-castaneous, adpressed scales and some few rufous hairs. Lamina 1 m long, ovate; basal pinnæ 30 cm long, a little shorter than those of the following pair, the lower side the larger at the lower third; the basal basiscopic pinnula is about opposite to the third acroscopic one; the basal acroscopic pinnula is the shortest. The cutting of the lamina does not differ from *D. squamosissima*, but it is on both sides throughout densely pilose by articulated, crisped, long hairs, the margins densely ciliate. Costulæ beneath with scattered linear, black-brown fibrils, very different from the broad, rufous scales of *D. squamosissima*. The medial or supramedial sori are apparently exindusiate, by which character our new species differs from *D. andicola*, which it resembles very closely in colour, pubescence and scales, and if not a real, valid species, it is more probably a large, exindusiate form of *D. andicola* than a pilose form of *D. squamosissima*.

334. **Dryopteris Karsteniana** (Kl.) Hieron. Hedwigia **46**: 348. 1907.

Syn. *Polypodium Karstenianum* Kl. Linnaea **20**: 390. 1847.
Phegopteris Karsteniana Mett. Pheg. 30 no. 63. 1858. Fil. Lechl. II. 27; Karsten, Fl. Columb. **2**: 97 tab. 150.
Nephrodium villosum var. *Karstenianum* Jenman, Bull. Dept. Jam. n. s. **3**: 104. 1896.
Dryopteris subincisa **Karsteniana* C. Chr. Ind. 295. 1905.
Polypodium barbatum Desv. Prodr. 242. 1827 (non Spr. 1827) ex descr.
Phegopteris hirsuta Fée, Gen. Fil. 248. 1852!
Aspidium erythrostemma Christ, Bull. L'Herb. Boiss. II. 4: 961. 1904!
Dryopteris erythrostemma C. Chr. Ind. 263. 1905.
Type from Venezuela leg. Karsten Coll. II. nr. 3 (B!).

A mighty species, perhaps the largest species of the genus, according to Karsten, who has given a detailed description and illustration of it, to which I refer, a true tree-fern with a trunk up to 2 m high and 1 m thick bearing at its top 8—10 leaves in a crown. Bases of stipes are densely coated with long reddish-brown, soft paleæ, very similar to those of *D. nemophila*. Leaves 2—3 m long, pinnæ up to nearly 1 m long; pinnules up to 15 cm long, though generally shorter, often terminating into a long-acuminated, serrate apex. In cutting and pubescence it resembles closely *D. villosa*, but it is exindusiate. From *D. subincisa* it differs greatly by its dense pubescence, while its scales are less different. Karsten describes

and illustrates them as being petiolate and without cilies round the base, which I, however, cannot confirm; they are castaneous, and patently toothed. The vascular parts of the whole leaf are throughout densely and softly pilose by long, articulated, flexible hairs, while the leaf-tissue of both sides are practically glabrous. The tertiary, obtuse or acute segments are almost all lobed halfway down into close, truncate, somewhat falcate lobes. The midvein of an adnate posterior segment of an upper pinnula springs out near the base of the costule.

While the specimens from Venezuela and Jamaica are so much more hairy than *D. villosa*, most specimens from Ecuador are often subglabrous and those from Guatemala (var. *Heydei* n. var.) are entirely without long hairs. The long hairs are evidently easily deciduous and older leaves, therefore, glabrescent. These subglabrous forms do not otherwise differ at all from the more villous form; they may be distinguished from *D. subincisa* by the larger size, long-acuminated pinnules and by the proportionally narrower and longer tertiary segments, which are deeply lobed throughout. *D. Karsteniana* is so closely related to *D. villosa*, that I understand that JENMAN considered it an exindusiate variety of it. There is, however, no evidence of the existence of intermediate forms, and it is no doubt a valid species. Its occurrence in Jamaica shows once more the close relation of the floras of that island and of the northern Andes.

Jamaica, HART nr. 115 (W): below New Haven Gap, UNDERWOOD nr. 3154 (W).

Costa Rica, WERCKLÉ (RB, type of *A. erythrostemma* Christ).

Venezuela: Tovar, MORITZ nr. 459 (B, S); KARSTEN nr. II. 3 (B); FENDLER nr. 447 (Kew); Merida, FUNCK et SCHLIM nr. 975 (L = *Ph. hirsuta* Fée).

Colombia: between Popayan et. Mt. Huila, STÜBEL nr. 144 (B).

Ecuador: Tunguragua, SPRUCE nr. 5257 (Kew), 5257 A (H, Kew, L, S); prope Pisum, MILLE nr. 114 pt. (RB); Chimborazo and other localities, SODIRO (RB, glabrescent forms = *Nephr. amplum* Sod. pro parte).

var. **Heydei** n. var. Glabrous; in a dried state nearly black above.

Guatemala: Rio de los Esclavos, Dept. Santa Rosa, HEYDE et LUX ed. J. D. S. nr. 3249 (W — distributed as *Nephrodium amplum* Bak.).

A fragment of an apparently large leaf from Colombia: Andes de Subia, 2500 m. MAYER no. 9, received from Dr. ROSENSTOCK belongs probably to a distinct, undescribed species, allied to *D. Karsteniana*. It is similar in cutting and pubescence, but the long hairs are remarkable swollen at base, about as the hairs of *Urtica urens;* they leave raised points when falling.

Obs. Mr. MAXON suggests in a note that the Jamaican specimens referred above to *D. Karsteniana* may belong to the species that is illustrated on Plumier's plate 34, upon which both *Polypodium pulverulentum* Poir. Enc. 5: 555. 1804 and *Aspidium lutescens* Willd. sp. 5. 272. 1810 were founded. It is possible, and it is true that the plate gives a rather accurate figure of the Jamaican fern. Still *D. Karsteniana* is till now not found in Santo Domingo, where PLUMIER gathered his plant, and his description of it as being »*lutescens*« below seems best to agree with *D. ampla*.

335. **Dryopteris grandis** (Presl) C. Chr. Ind. Fil. 1905.

Syn. *Polypodium grande* Presl, Del. Prag. I. 171. 1822.
Polypodium auriculatum Raddi, Opusc. sci. Bol. **3**: 288. 1819 (non L. 1753).
Polypodium formosum Raddi, Pl. Bras. **1**: 25 tab. 38. 1825.
Polypodium macropterum Kaulf. Enum. 111. 1824! (H).
Phegopteris macroptera Fée, Gen. 243. 1852; Cr. vasc. Br. **1**: 99. 1869.
Polypodium splendidum Kaulf. Enum. 112. 1824; Hook. & Bak. Syn. Fil. 312.
Polypodium macopterum β *splendidum*. Bak. Fl. bras. 1^2: 502.
Phegopteris splendida Fée, Gen. 243, 1852; Cr. vasc. Br. **1**: 101. 1869; Mett. Pheg. nr. 60.
Polypodium repandum Vell. Fl. flum. **11** t. 73. 1827.
Alsophila Fischeriana Regel, Ind. sem. ht. Petr. 1855; Linnaea **28**. 366! (B).
Polypodium Fischerianum Bak. Syn. ed. I. 455. 1868.
Polypodium Pohlianum Pr. Pent. 180. 1836 (nomen). (B!)

Type from Brazil, leg. (Pohl?) (not seen, but there is no doubt of the right interpretation).

A very distinct species of a somewhat doubtful position, often confounded with the less divided forms of *D. connexa*. It differs, however, from that species as well as from all other species of this group by the absence of articulated, rufous hairs (*Ctenitis*-hairs) on the costules and costæ above. Besides it is well-marked by its thick, papyraceous texture and brownish colour when dried, and by its little cut lamina that is bipinnatifid or bipinnate only. — Basal scales rather soft, brown, linear, often very narrow, flexible, sharply and retrorsely dentate; similar smaller, hairlike scales are to be found on the rachis and costæ beneath. Upper surface perfectly glabrous, the margins ciliate, the under surface generally glabrous, rarely with scattered, articulated hairs or very finely puberulous especially on the costæ (f. *Fischeriana* Regel). Veins pinnate in the lobes, immersed, simple, furcate or again pinnated, very oblique, nearly or quite reaching the margin. Sori slightly immersed, in 1—3 rows on each side of the midvein of the segment, rather small, often yellowish. Indusium none.

D. grandis is very variable in size and cutting. Most authors distinguish two species or varieties, viz:

1. (*P. macropterum* Klfs.). Leaf bipinnatifid or bipinnate below only. Pinnæ 10—20 cm long, 3—4 cm broad, acuminate, incised about two-thirds of the way down into arcuate, obtuse, entire segments, about 1 cm broad. Lateral veins simple or furcate, the basal ones springing out from the costa and terminating in the leaf-tissue below the sinus. Sori in 2—3 rows on each side.

2. (*P. splendidum* Klfs.). Much larger, fully bipinnate below, deeply bipinnatifid at the middle. Middle pinnæ 20—30 cm long, 6—8 cm broad, incised nearly to the costa into arcuate, obtuse faintly serrulate or crenate segments, $1^1/_2$ cm broad. Lateral veins pinnate, 2—3 jugate, the basal ones springing out from the midrib of the segment. Sori in 1—3 rows on each side.

As far as I can see it is hardly possible to distinguish these two forms from each other; the extremes described are connected by all possible intermediate forms.

D. grandis is apparently confined to the mountains round Rio de Janeiro (Corcovado, Tiyuca, Serra dos Orgãos) and it is gathered by nearly all collectors, f. inst. Glaziou nr. 966 (H = f. *Fischeriana*), 1676 (H, Rg), 5299 (B), 5385 (B, H. Rg), 5386 (B, H); Regnell nr. 256 (Rg); Mosén nr. 2695 (B, H, L, Rg, S, U) and others.

336. **Dryopteris connexa** (Kaulf.) C. Chr. Ind. 258. 1905.

Syn. *Polypodium connexum* Kaulf. Enum. 120. 1824; Mart. Ic. Cr. Bras. 90 t. 65.
Phegopteris connexa Fée, Gen. 243. 1852, Cr. vasc. Br. **1**: 101; Mett. Pheg. nr. 61; Fil. Lechl. II. 26.
Polypodium macropterum γ *connexum* Bak. Fl. Bras. **1**[2]: 502.
Phegopteris scrobiculata Fée, Cr. vasc. Br. **1**: 102 t. 31 f. 2. 1869.
Phegopteris eriopodia Fée, l. c. 102 t. 31 f. 1.
Phegopteris adnata Fée, l. c. 103.
? *Phegopteris propinqua* Fée, l. c. 103 t. 32 f. 3.
Polypodium Willsii Bak. Ann. of Bot. **5**: 458. 1891!
Dryopteris Willsii C. Chr. Ind. 301. 1905.

Type from Brazil: Santa Catharina leg. Chamisso (not seen, but a specimen in B is said to agree exactly with the fragmentary original specimen in Herb. Kaulf. no. 879 (on a label by Mettenius). I, therefore, consider that specimen typical).

An extremely variable species, if the numerous forms referred to it really belong here; scarcely two specimens are exactly alike. Still I cannot find good characters by which they may be distinguished. It varies especially in size, degree of cutting and cutting. The typical specimen mentioned above may be described thus.

Lamina tripinnatifid; pinnæ at distances of 8 cm, stalked, acuminate, about 25 cm long. Basal pinnules sessile, the middle ones decurrent and connected by a wing, 6—7 cm long, 1 cm broad, shortly acuminate; lower basiscopic pinnules of basal pinnæ somewhat longer, otherwise not different. Pinnules lobed about halfway down to the midrib into truncate, somewhat arcuate lobes. Texture chartaceous, colour when dried brownish. Rachis and costæ beneath very sparsely fibrillose with linear, hairlike, dark-brown, toothed scales. Costæ and costules above antrorsely strigose with subulate, rather long hairs; the veins above with similar, scattered setæ; margins ciliate; costæ and costules beneath laxly pubescent with articulated, rather soft, long, whitish hairs; short hairs none. Veins subpinnate in the lobes, not reaching the margin. Sori 4—6 to a lobe, about medial, exindusiate.

The rhizome, as shown in more complete specimens, is erect, thick, densely coated with soft, linear, ferrugineous, sharply toothed scales, which are more or less wool-like and intertangled; Mettenius (Fil. Lechl. II. 26) described them as being margined by thicker cells, which I, however, cannot see.

D. connexa differs from *D. grandis* by its tripinnatifid lamina and by its strigose

costæ, from *D. Blanchetiana* by its soft, wool-like basal scales and sparse pubescence from *D. subincisa* by its basal scales and pinnules of basal pinnæ, shortened above not very produced below. With regard to pubescence it is, however, very variable; most specimens seen lack the long, whitish hairs beneath; and in some forms the costæ above are shortly rusty-pubescent with *Ctenitis*-hairs without long antrorse setæ. I consider these differences little important; they are due, I think, to age and different conditions of the growing-places. Also in cutting the species varies considerably, some specimens are nearly or fully tripinnate with the pinnules incised nearly or quite to the midrib. The largest specimen seen has the basal pinnæ 70 cm long, tripinnatifid, with the basal basiscopic pinnula 20 cm long.

The species is widely distributed through the southern provinces of Brazil. I have thought it possible to distinguish local forms or varieties, but I have found it difficult to find good characters. In the mountains round Rio de Janeiro some forms occur that Fée has described as species (see synonyms); these »species« are, however, very slightly different from each other, and they all belong to the same form, which perhaps should be separated from the true *connexa* as a variety (var. *eriopodia*). This somewhat approaches *D. grandis* by the costæ above being rusty-pubescent by short *Ctenitis*-hairs, while the leaf otherwise is quite glabrous, by the brighter, narrower, wool-like, basal scales and by the basal veins, which end in the leaf-tissue below the sinus. The specimens from Minas Geraes are the largest seen, more scaly than other forms and generally rather pubescent beneath on costules and veins. *P. Willsii* Bak., a cultivated fern (Hort. Wills 1881), said to originate from Rio Janeiro, is to me a small form of typical *D. connexa* (Kew!).

Below I enumerate some of the numerous species seen:

Brazil: Para, Spruce nr. 22 (Kew) — Minas Geraes: Lindberg nr. 547 (B), Mosén nr. 2184 (B, H, L, Rg, S, U, very large, perhaps different), 2186 (L, S, U), 2187 (Rg), 2188 (Rg, S, U) — Rio de Janeiro: Gardner nr. 134 (Kew), Glaziou nr. 1780, 2066 (H = *Ph. scrobiculata* Fée), 2397 (H, Rg = *Ph. eriopodia* Fée), 2798 (H, Rg = *Ph. adnata* Fée), 7246 (B, H), 7498 (H) — São Paulo: Regnell nr. 50, 51, 52 (U), Mosén nr. 3091 (Rg), Heiner nr. 533 (Rg); Ulbricht nr. 52, 94 (R), A. & C. Brade nr. 5373, 6531 (R), Wacket nr. 177 pt. (R), — Paraná: Dusén nr. 10339, 13531 (Rg), Annies nr. 36, 56, 65 (R) — Sta. Catharina: Ule nr. 193, 194 (B), Spannagel nr. 105 (R), Haerchen nr. 79 (R), O. Müller nr. 31, 76, 123 (R), Goltz nr. 39 (R) — Rio Grande do Sul: Jürgens & Stier nr. 38, 48, 197, 231, 275 (R); Lindman nr. A 869, A 985 (L, Rg, W).

Uruguay: Dep. Tacuarembo, Gruba de los helechos, C. Osten nr. 6619 (R), W. Herter nr. 3534 a RB)

var. **lateadnata** (Christ).

Syn. *Phegeopteris late-adnata* Christ, Ann. Cons. Jard. bot. Genève 3: 36. 1899. *Dryopteris latealata* (err. typogr.!) C. Chr. Ind. 274. 1905.

Differs from most Brazilian forms by its thinner texture, nearly all pinnules short-stalked, only the uppermost ones being adnate and decurrent, and by its nearly quite glabrous leaf; the costæ above are finely puberulous, both surfaces

otherwise glabrous. — It may be specifically different, but having seen no perfect leaf I prefer to place it under *D. connexa* as a variety, with which it agrees fairly well in most characters.

Paraguay: Balansa nr. 313 (CC, S). 313 a (B, L, *type*), 313 b (CC), 2910 (B, H); prope Sapucay Hassler nr. 12203, 12204 (H, R).

Obs. Christ has described another species from Paraguay, *Phegopteris subsimilis* (l. c. p. 36) = *Dryopteris paraguayensis* C. Chr., Ind. 282 (Balansa no. 304), which I have not seen. It is, however, scarcely a species of *Dryopteris* as the author says: stipite basei aculeis nonnullis armato, which certainly is never found in any species of *Dryopteris*. It is probably a species of *Alsophila*.

337. **Dryopteris umbrina** n. sp.

Type from Brazil: São Paulo, Brade no. 6532 (R!).

Species austrobrasiliensis *D. vastae* subsimilis, multisquamosa, sicca atroviridis, herbacea. Stipite rachi costisque fuscis, squamis lanceolatis, umbrinis, basalibus dentatis, superioribus integris ubique subdense onustis, et breviter puberulis. Lamina supra praeter costas costulasque dense et venis sparsim pilis albidis strigosas glabra, subtus ad costas costulasque breviter et dense puberula, ad parenchyma venasque subglabra, minute glandulosa. Soris parvis, parum supramedialibus, exindusiatis. Divisione laminae et forma segmentorum *D. subincisae* similis.

This new species may easily be distinguished from all other South-Brazilian species of this group by its dark-green, herbaceous leaf and numerous scales on stipe, rachis and costæ, it resembles more some of the andine species by several characters which are here all united in the same species while they are separated in the andine species. *D. squamosissima* and *D. mollicoma* have similar scaly stipe and rachis but the pubescence is different. *D. vasta* has the rachis and costæ beneath similarly puberulous, but it has much fewer scales and both surfaces finely downy. *D. spectabilis* is much firmer and has long hairs. *D. andicola* that is indusiate, and *D. atrogrisea*, resemble our species very much in colour and cutting, but their scales and pubescence are different. As is the case in the two last-named species the basal posterior segment of an upper pinnula of *D. umbrina* is nearly separated from the costule and broadly adnate to the costa from which its midvein springs out rather distant (2 mm) from the base of the costula.

D. umbrina is a middle-sized species. The accepted type-specimen which is the largest seen, has the middle pinnæ 35 cm long, but most other species are smaller with the ovate lamina 50—60 cm long. In shape and size of the tertiary segments it scarcely differs from *D. subincisa* and *D. vasta* and also *D. Blanchetiana*. — The species has probably been united with *D. subincisa* by most authors.

Brazil: São Paulo: Serra do Cantareira. A. C. Brade nr. 6532 (R); Campinas, A. Heiner nr. 601 (Rg). — Minas Geraes: Poco d'Anta, Schwacke nr. 14985 RB; Capao (?), Regnell nr. III. 1447 U;

Caldas, LINDBERG (B) — Sta. Catharina: Itapocu, SCHWACKE nr. 12995 (RB); Joinville, MÜLLER nr. 162 (R): Blumenau, H. SCHENCK nr. 843 (B).

Paraguay: Sierra de Amambay, T. ROJAS ed HASSLER nr. 10421 (B).

338. **Dryopteris Blanchetiana** (Kze.) Hieron. Hedwigia 46: 344. 1907; C. Chr. Ind. Suppl. 30.

Syn. *Polypodium Blanchetianum* Kze herb. (Mett. Pheg. 30 as syn.)
Phegopteris canescens (Kze.) Mett. Pheg. 30 no. 64. 1858; Fil. Lechl. II. 26.
Polypodium canescens Kze. herb.; Hook. sp. 4: 262. 1862 (non Bl. 1828 = *Dryopteris canescens* C. Chr.)
Polypodium villosum var. *canescens* Bak. Fl. bras. 1[2]: 484. 1870.
Dryopteris subincisa *canecens* C. Chr. Ind. 296. 1905.
Phegopteris cana Mett. Ann. Lugd. Bat. 1: 223. 1864 (non *Dryopteris cana* (J. Sm.) O. Ktze.).
Phegopteris mollivillosa Fée, 10. mém. 32. 1865; Cr. vasc. Br. I. 101. 1869.

Type of METTENIUS from Brazil: Bahia, leg. MORICAND no. 2454 (not seen); the name *Pol. Blanchetianum* was applied to specimens from Bahia, leg. BLANCHET (B! RB!), which I here consider the type of the species. The same was collected by SELLOW (R) and by MARTIUS no. 320 (B), both from Bahia (?).

Differs from all Brazilian and andine species of this group by its lamina being softly villous on rachises and both surfaces with shorter and longer hairs intermixed, sporangia intermixed with long hairs. In size and shape of tertiary segments it closely resembles *D. subincisa*, but the costæ beneath appear to be perfectly scaleless. All the specimens seen are very fragmentary. The basal scales are described by METTENIUS as rigid, blackish, shortly toothed, with darker edges. — The species seems to be rare and found only in North-east Brazil.

339. **Dryopteris macrosora** (Fée) C. Chr. comb. nov.

Syn. *Phegopteris macrosora* Fée, Gen. Fil. 243. 1852 (name only).
Polypodium subincisum Mart. Ic. Cr. Bras. 89 (ex parte?) tab. 64. 1834.
Polypodium inaequale Klf.; Link, Hort. Berol. 2: 107. 1833! (B) (non *Dryopteris inaequalis* (Schl.) O. Ktze.
Polypodium duplicato-vestitum Beyrich hb. (Mett. Pheg. 20 as syn.)!
Phegopteris spectabilis Fée, Cr. vasc. Br. I. 103. 1869 (non 1852)!
Phegopteris epireoides Fée, l. c. 104 (non 1852)!
Phegopteris marginans Fée, l. c. 104 tab. 61 fig. 1. 1869, ex descr. et icon.
Phegopteris fulgens Mett. hb., Schenck, Hedwigia 35: 166. 1896 (nomen)!

Type from Brazil, leg. MARTIUS, that form figured on pl. 64 only, with which a specimen in B! exactly agrees; MARTIUS' detailed description probably covers other allied species.

The most distinct species among the numerous Brazilian forms allied to *D. subincisa*. It differs from all those, as well from *D. subincisa* and other andine species by its firm, chartaceous lamina, which as more or less shining, darker above, pale-green beneath, by its more lengthened and narrower tertiary segments, which are bluntly and often equally rounded at the apex, or the larger ones somewhat narrowed upwards and bluntly crenate at both edges, not serrate, by its supramedial sori and by its pubescence and scales. Costules and veins above with some scattered long setæ, long hairs elsewhere absent, but the costules beneath are very finely or rather densely puberulous. Basal scales large, lanceolate, castaneous, rigid subentire or very faintly toothed; similar but smaller scales are scattered along the rachis and costæ beneath; costæ of the upper, smaller pinnæ and costulæ beneath with several small bright-brown or reddish-brown, ovate or ovate-lanceolate, entire, scales. The veins are forked and the shorter anterior branch produces a sori near its apex close to the crenature of the margin. Only the uppermost pinnulae are adnate at the posterior base, scarcely decurrent, and the midvein of an adnate segment always springs out from the costula, as a rule a little above its base.

The above characters make this species very different from all other species allied to *D. subincisa;* it has some resemblance to *D. crenulans* in habit and by its peculiar reddish-brown ovate scales of the costules beneath and also in its short pubescence, but the basal scales are different and the sori are exindusiate; also the shining surface and firm texture are different.

Brazil: Para, Martius (B) — Rio: Martius (B), Riedel B, Beyrich (RB), H. Schenck nr. 2941 (B, RB), Glaziou nr. 967 (H, Rg), 2395 (H), and others, — São Paulo, Rais da Serra, Wacket nr. 177 pt. (R).

340. **Dryopteris abundans** Rosenstock, Hedwigia **46**: 133. 1906. — Fig. 17.

Syn. *Dryopteris Martiana* Rosenst. l. c. 132 (excl. syn. et icon. cit.).

Type from Brazil, leg. Jürgens nr. 195 (R!).

Allied to *D. macrosora* but quite distinct. It is one of the largest and the most finely cut species of the whole group, nearly quadripinnate, quinquepinnatifid below. Middle pinnæ 50 cm or more long, secondary pinnules nearly all stalked, 10—12 cm long, their apex long-acuminated, serrate or crenate; tertiary pinnules of the lower half of the secondary pinnules free, 2 cm long, 6—8 mm broad, shortly acute or subobtuse, incised nearly to the midrib into oblique, obtuse or truncate quaternary segments. Veins nearly or quite reaching the veins. — Basal scales large, up to $3^1/_2$ cm long, 3 mm broad, castaneous, firm, glossy, entire at the lower part, retrorsely shortly dentate towards the acuminate apex. Scales of rachises and costules beneath very few, practically none, the few found ovate-lanceolate, dentate. Pubescence about as in *D. macrosora,* long hairs being found on the costules and veins above; costules and midribs beneath densely, and both surfaces, especially the lower one sparsely very shortly puberulous. — Sori small, supramedial. — Texture herbaceous, both surfaces dark-green, not shining.

Rosenstock made two species, which to me are quite identical. He believed that the specimens named by him *D. Martiana* were referable to *Polypodium subincisum* Mart.; but he was certainly wrong in this, Martius' species being our *D. macrosora*. From this *D. abundans* differs by its more finely cut leaf, its thinner texture, the not shining, dark-green surfaces and by its very few scales of the costules beneath. The pubescence and basal scales are essentially the same. *D. abundans* recalls rather *D. adenopteris* by habit and short pubescence, but the basal scales are widely different and it is not glanduloso-pubescent. It is till now known from the Southern Brazilian provinces only:

Rio Grande do Sul: Legoas do Herval do Paredão, C. Jürgens nr. 195 (R, type, distributed as *D. Martiana* var. *abundans* Ros. Fil. austrobras. exs. nr. 367 (B, Rg, W).

Paraná: Villa Nova, Annies nr. 71 (R = *D. Martiana* Ros., distributed partly as *Polypodium subincisum* Willd. partly as *D. Martiana* Ros. Fil. austrobras. exs. nr. 117 (B. Rg, RB, W).

Without locality: Riedel (Rg).

Fig. 17. a. Pinnula, nat. size and segment × 2 of *D. abundans* Ros. b segment of *D. Wacketii* Ros, × 2.

341. **Dryopteris Wacketii** Ros. ms., n. sp. — Fig. 17 b.

Type from Brazil: São Paulo, Pilar, leg. M. Wacket no. 223 (R).

Species anstrobrasiliensis major, bimetralis, pilosa, herbacea quadripinnatifida. Stipite fusco, versus basin squamis lanceolato-linearibus, castaneis, remote et leviter dentatis subdense paleaceo, et ut rachi pilis brevissimis aliis longis adpressis imprimis versus basin intermixtis dense puberula hirtaque. Lamina herbacea, sicca atroviridi, quadripinnatifida. Pinnis usque ad 40 cm longis, pinnulis 8 cm longis, $2^1/_2$ cm latis, usque ad costulam pinnatifidis, supremis solum basi adnatis, tertiariis densis, basi utrinque dilatatis, inferioribus liberis, superioribus contiguis, $1—1^1/_2$ cm longis, 3—4 mm latis, obtusis, profunde pinnatifidis; segmentis quaternariis falcatis, obtusis. Pagina superiore ad costas costulasque dense ad venas parcius strigosa, inferiore ad costas costulasque pilis longis patentibus et brevibus intermixtis dense hirtis, ad parenchyma brevissime puberula et glandulosa. Rachi ut costis subtus squamis parvis castaneis sparsissime onusta. Venis furcatis vel subpinnatifidis; venula basali anteriore breviore sorifera. Soro in quoque lobo singulo costulae pinnulae tertiariae approximato, exindusiato, parvo; sporangiis paucis, laxe coacervatis, interdum pilis longis intermixtis.

This has no near relative in Brazil; it bears some resemblance to *D. Karsteniana* by its dense pubescense and narrow, deeply pinnatifid tertiary pinnules, but the glandulose underside and the dense short pubescence of the rachis besides the

longer, deciduous hairs are different. I refer hereto two more specimens leg. Riedel, without locality (Rg) and, Mendonça, no. 1376, Friburgo (B), which agree in texture and cutting, but they lack the short hairs on rachis and underside, thus approaching *D. Karsteniana*.

342. **Dryopteris adenopteris** n. sp. — Fig. 18.

Syn. *Neprodium villosum* Lindman, Ark. f. Bot. 1: 226. 1903, non Presl.

Dryopteris villosa var. *tomentosa* Rosenst. Hedwigia 46: 130. 1916.

Type from South Brazil, leg. Lindman no. A 1313 (Rg).

Species valde distincta, pulcherrima, *D. amplae* proxime similis differt: lamina longius pubescente et dense glandulosa, parcissime squamosa, soris margini approximatis. »Planta gigantea, acaulis, frondibus usque 4 m longis« (Lindman). — Rhizomate erecto, apice ut basi stipitum squamis linearibus rufescentibus nitidis textura iis *D. amplae* similibus sed paucioribus vestito. Stipitibus fusco-stramineis, sursum parce squamosis, mox glabris. Lamina ovato-deltoidea, 1—2 m longa, gramineo-vel saepe luteo-virescente, firmiter herbacea, basi quadripinnatifida, medio tripinnatifida. Pinnis basalibus deorsum basi auctis, mediis oblongis, ad 40 cm longis, stipitatis, acuminatis. Pinnulis inter se 3 cm distantibus, breviter petiolatis, superioribus adnato-decurrentibus; oblongis, breve acuminatis, ad 10 cm longis, 1½—2 cm latis, fere ad costulam pinnatifidis. Segmentis tertiariis parum obliquis, subacutis vel potius subobtusis, 3—4 mm latis, basali posteriore parum reducta, regulariter crenatis vel inferioribus profundius lobatis, lobis rotundatis. Venis parum conspicuis, simplicibus furcatisve, marginem vix attingentibus. Squamis rachis costarumque perpaucis, tenuissimis, minutis, luteis. Lamina utrinque dense et minute glandulosa, imprimis ad paginam inferiorem, supra ubique pilis brevibus hirtella, subtus minute ac dense puberula. Soris margini approximatis, saepe luteo-brunneis; indusiis minutis, glandulosis, setosis.

Fig. 18. *D. adenopteris* C. Chr. Secondary pinna, nat. size: two tertiary pinnules from a lower pinna from the underside and two others from a superior pinna from the upperside, × 2.

This new species is a most interesting novelty, the right systematical position of which it is difficult to fix with certainty. It is as to several characters intermediate between the groups of *D. ampla* and *D. subincisa*. In general habit and colour it

resembles *D. ampla*, and the indusiate sori (indusia small and fugacious) and the non adnate posterior basal segments are characters that seem to prove its alliance with *D. ampla*, but the longer hairs and the few scales are, however, very similar to a species such as *D. crenulans*, which no doubt is a near ally of *D. villosa*. It must also be remembered that no species of the *ampla*-group has been recorded from South Brazil, where a series of species belonging to the *subincisa-villosa*-group occur, some of which in certain characters are rather like *D. adenopteris*. I, therefore, find it, convenient to place the species in this group. In some specimens the lobes are recurved over the sori, reminding one of *Hypolepis*, species of which have a certain resemblance to our species.

I have seen a good many specimens from three collections; they are all fully alike with the only exception that the type-specimens are, as it seems, exindusiate, while the others have very minute, setose indusia.

South Brazil: Rio Grande do. Sul: Silveira Martins, Val Veneta, ad terram silvæ primævæ, Lindman nr. A. 1313 (CC, L, Rg, S, U, W); Munic. Rio Pardo, Fac. Soledade, C. Jürgens ed. Ros. Fil. austrobras. exsic. nr. 207 (B, R, W).

Argentina: Prov. de Tucuman, Capital Yerba Buena, L. Castillon (RB).

343. Dryopteris hirtula (Kze.) C. Chr. Ind. Fil. 270. 1905.

Syn. *Polypodium hirtulum* Kunze in Steud. Nomencl. **2**: 341. 1824 (nomen).
Polypodium hirsutum Sw. Vet. Akad. Handl. **1817**: 61; Bak. Fl. bras. 1^2: 503 tab. 64 fig. 1.
Polypodium lasiernos Spr. Syst. 4: 61. 1827.
Phegopteris lasiernos Mett. Phegopt. n. 58. 1858.
Polypodium myriotrichum Bak. Journ. Bot. **1885**: 217.
Type from Brazil, leg. Freyreis (S!).

A well-known, smaller, xerophilous species from the plateaus of Brazil, totally different from all other Brazilian species, but I should think it is in some way related to *D. Karsteniana*, although its position in the genus is problematical. The long, pale-yellow, thin, lanceolate, hair-pointed basal scales with long-fimbriated edges are quite unique. The very dense woolly pubescence of the whole frond, especially of the stipe and rachises consists of thin, flexible, pluricellular, pale hairs, of the stipe and lower part of the rachis, sometimes also of the costæ beneath intermixed with linear-lanceolate, pale scales. Sori with many similar hairs between the sporangia. The lanceolate lamina that reaches 50 cm in length by 25 cm wide at the middle, though often much smaller is tripinnatifid with the basal pinnæ somewhat reduced, equal-sided and much reflexed. *P. myriotrichum* Bak. is a large form with not so deeply cut secondary pinnules.

Brazil, Freyreis (H, S); Minas Geraes, Glaziou nr. 15734 (B, H, Kew) 20157 (B), Itaculumi, Damazio nr. 1785 (R).

344. **Dryopteris villosa** (L.) O. Ktze. Rev. Gen. Pl. 2: 814. 1891; C. Chr. Ind. 300. — Fig. 19.

Syn. *Polypodium villosum* L. sp. 2: 1093. 1753.

Aspidium villosum Sw. Schrad. Journ. 1800[2]: 39. 1801; Syn. Fil. 56!; Schkuhr, Kr. Gew. 194 t. 46 B.

Nephrodium villosum Pr. Rel. Hænk. 1: 38. 1825; Hook. sp. 4: 134 t. 264; Jenman, Bull. bot. Dept. Jam. 3: 114 et W. Ind. and Guiana Ferns 222, excl. varr.

Type from Jamaica? — LINNAEUS quoted besides *Pet. fil. 52 t. 4 f. 10* and Sloane: jam. 23 also PLUMIER tab. 27; this plate illustrates a plant from Santo Domingo. I have seen specimens from both islands and they are rather alike. In the following I describe the Jamaican form.

Rhizome or caudex erect, up to 25 cm thick and nearly one meter high, at last prostrate, together with the lower part of the stipes clothed with many lanceolate-linear, dark-brown, sometimes glossy-castaneous scales, 2 cm long, 2 mm broad, which are toothed with short, subulate often retrorse teeth especially towards the hair-pointed apex. Stipes up to 1½ m long, 1 cm thick, sulcate above, upwards laxly paleaceous with large scales like rachis. Lamina deltoid, up to 2 m long and broad, chartaceous, dark-brown green, quadripinnatifid below, tripinnatifid at the middle. Basal pinnæ the largest, 1 m or more long with the basiscopic side much produced, the basal pinnula reaching 50—70 cm in length, about opposite to the second acroscopic pinnula. Middle pinnæ oblong-acuminate, 40—60 cm long, shortly petiolate. Pinnules at nearly right angles to the costa, the lower ones shortly stalked, oblong, often abruptly acuminate, 10 cm long, 2½ cm. broad, the uppermost ones shortly adnate at the posterior base, the larger ones incised to the midrib at the lower third. Tertiary segments or pinnules oblong, broadly obtuse, 3—4 mm broad, entire, crenate or of large specimens rather deeply lobed below the rounded, entire apex; lobes 5—6 jugate, truncate. Veins of ultimate lobes once

Fig. 19. *D. villosa* (L.) O. Ktze. Secondary pinna, nat. size, and two tertiary pinnules, × 2.

forked or subpinnate with a single branch to each side, not reaching the margin, terminating in a hydathode seen on the upperside as a narrow, oblong, brown spot; midvein of a posterior basal segment of an upper pinnula springs out from the costa near the base of the costula. Upper part of rachis and costæ above densely rusty-tomentose by *Ctenitis*-hairs: costules and veins on both sides villous by long, whitish hairs, the margins ciliate; leaf-tissue as a rule glabrous; underside often minutely glandulose. Costæ and costules laxly paleaceous beneath with lanceolate or linear, yellowish-brown, thin, toothed scales that are rather inconspicuous and often hidden between the long hairs. Sori one to each lobe near the tip of a very short anterior branch of the furcate vein. Indusium large, firm, castaneous, persistent, reniform with a very narrow sinus, glabrous or with some few long hairs at the centre, minutely glandular at margins. Spores small, very minutely and densely papillose.

D. villosa has been recorded from most countries of tropical America, still it is, as I understand the species, apparently confined to Jamaica and Santo Domingo; the continental forms referred to it belong to allied but clearly distinct species. According to JENMAN it is frequent in Jamaica in damp woods and forests especially near water courses, above 2000 feet altitude. It is somewhat astonishing that JENMAN follows BAKER in referring *D. Karsteniana* and *D. subincisa* as varieties to *D. villosa*. Besides their sori being exindusiate they differ in several other important characters.

Jamaica: SWARTZ (S), PURDIE (B), DAY nr. 184 (B); UNDERWOOD nr. 1326, 3462, 3464 (W); MAXON nr. 926, 1566 (= UNDERWOOD nr. 2616), 2326 (W); HART nr. 115 a (W), CLUTE nr. 161 (W); FISCHER (RB); D. WATT nr. 156 (RB).

Santo Domingo: Prov. Barahona, FUERTES nr. 1081 (B, W).

345. **Dryopteris andicola** n. sp.

Syn. *Nephrodium villosum* var. *opaca* (Mett.) Hieron. Engl. Jahrb. **34**: 446. 1904 (*Aspidium opacum* Mett. Mss., non *Dryopteris opaca* (Don) C. Chr. Ind.)

Nephrodium villosum auctt. quoad pl. and.

Type from Ecuador, leg. SPRUCE no. 5295 (B!).

This is the andine form of *D. villosa* sens. lat., agreeing with the genuine *D. villosa* in its large, persistent indusia, differing in size, cutting, colour and pubescence. — Much smaller than *D. villosa*, judging from the specimens seen, the largest of which is scarcely one meter long. Lamina ovate, dark-green, tripinnatifid. Basal pinnæ scarcely longer than the following pair, sometimes a little shorter, their lower side slightly produced. Middle pinnæ 15—20 cm long, 6—8 cm broad. Pinnules obtuse, almost all sessile and broadly adnate-decurrent at the posterior base, pinnatifid nearly to costula. Tertiary segments truncate, 3—4 mm broad, entire or crenate, the basal posterior one of most pinnulæ broadly adnate to the costæ and often placed about midways between two pinnules with the midvein springing out 1—2 mm from the base of the costula. Scales dark olivaceous-crown,

toothed, those of the costæ beneath darker and more conspicuous than in *D. villosa*. Rachis and costæ on both sides densely villous with longer and shorter hairs intermixed; both surfaces throughout (veins and leaf-tissue) densely long-hairy. Spores distinctly papillose.

HIERONYMUS distinguishes between two forms:

1. f. *Spruceana* Hieron. l. c. Sori 4—6 to each segment, the indusia large, pale-edged.

2. f. *Lehmanniana* Hieron. l. c. Sori 1—3 to each segment, the indusia smaller, concolorous.

Other forms based on smaller differences in pubescence could be separated out, but with the comparatively few specimens at hand I find it advisable to point out only by which characters these andine forms differ from *D. villosa*. Further material will show, I guess, that *D. andicola* is an aggregation of several allied species.

Colombia: Pacho, Cundinamarca, LEHMANN nr. 7369 (B); Montana del oro, Cauca, LEHMANN nr. 7416 (B); Fusugasuga, LINDEN nr. 843 (B, Kew, RB), KARSTEN nr. 274 (B); LINDIG nr. 159 (B. fragm.)

Ecuador: Chimborazo, SPRUCE nr. 5225 (B); Tunguragua, STÜBEL nr. 852 (B); Avitagua, STÜBEL nr. 896 (B); Quito, SODIRO (B); LEHMANN nr. 101 (CC); Canelos, SPRUCE nr. 5295 (CC).

346. **Dryopteris acrosora** (Hieron.) C. Chr. Ind. 250. 1905.

Syn, *Neprodium acrosorum* Hieron. Engl. Jahrb. **34**: 446. 1904.

Type from Colombia: in monte Cerro Pelado, leg. STÜBEL s. n. (B!); without locality, leg. SCHMIDTCHEN (B!).

Remarkable by the sori being confined to the upper third or fourth of the segments, 3—5 together, very close. If this character is a constant one, as it appears, the species is easily recognizable; as to most other characters it agrees with *D. villosa* and its allies, still it differs somewhat in pubescence: the whole leaf is beneath finely downy, most densely so on the midribs, without or with comparatively few long hairs: upperside throughout, chiefly on midribs and veins strigose by longer hairs. Rachis, costæ and costulæ beneath more or less paleaceous by lanceolate, entire, fuscous scales. Indusia large, persistent, reddish-brown, glabrous or with some few long hairs at the centre. — The Costa-Rican specimens have several long hairs beneath, which are lacking in the original specimens, but otherwise they agree.

Colombia: SCHMIDTCHEN (B), STÜBEL (B).

Costa Rica: La Hondura, Wercklé (RB, W); ibid. (La Palma), O. JIMENEZ nr. 603 (RB, W); La Palma, A. & C. BRADE nr. 349 — Ros. Fil. exs. costarr. nr. 156 (B, R, Rg).

347. **Dryopteris villosula** n. sp.

Syn. *Dryopteris villosa inaequalis* Gilbert, Bull. Torr. Cl. **24**: 259. 1897.

Type from Bolivia, leg. M. BANG nr. 2394 (B, W).

Another andine representative of *D. villosa*, resembling *D. andicola* very much in size, colour, cutting and numerous castaneous scales of primary and secondary rachises; it differs chiefly by its underside being throughout densely and shortly downy and besides finely glandulose. Upperside rather densely pubescent with longer whitish hairs on the ribs and shorter adpressed ones on the leaf-tissue. The rather numerous, castaneous, lanceolate scales are entire at the lower part, minutely toothed towards the apex. In cutting the species agrees with *D. villosa* and the exindusiate species *D. squamosissima* and *D. mollicoma*, i. e. the larger tertiary pinnules are obtuse, crenate or lobed and dilated equally to both sides at base. In pubescence and glandular underside it is nearly exactly like *D. adenopteris* and *D. crenulans* var. *glandulosa*, though with longer hairs above, but it differs greatly from both by its scales and from the former by its dark-brown, large indusia. As a whole this species may be considered an intermediate form between the andine and the South-Brazilian species of the narrower group of *D. villosa*.

Besides the type-specimens I refer hereto with certainty a young plant from Polo-Polo, Northern Yungas, Bolivia, Buchtien no. 3598 (R) although it has very few scales and the rachis long and softly hairy; more doubtful are other specimens from Yungas, Rusby no. 425 (W), which are exindusiate and closely resemble *D. mollicoma*.

348. **Dryopteris crenulans** (Fée) C. Chr. comb. nov.

Syn. *Aspidium crenulans* Fée, Cr. vasc. Brés. **1**: 139 t. 47 f. 1. 1869.
Aspidium (s. *Nephrodium*) *villosum* auctt. quoad pl. Brasil.
Aspidium consobrinum Fée, l. c. 140 pt. (non 11. mém. 85).
Type from Brazil, leg. Glaziou no. 1781 (cotype in H, RB).

A large species, though scarcely reaching the size of the true *D. villosa*. Largest pinnæ seen 50 cm long. In cutting scarcely different from *D. villosa*, but pubescence very different. Scales of rachis and costæ very few or absent, the basal ones fewer, thinner, brighter and flaccid, those of the costules ovate-acuminate with a bullate base. Midribs and veins above with comparatively few long setæ, underside throughout very shortly and rather densely puberulous, long hairs being few or absent, and more or less glandulose. Indusium large, castaneous.

To this species I refer a number of forms from South Brazil and the adjacent countries.

1. f. *typica* Underside very slightly or not at all glandular; long hairs few or absent. Indusium large, castaneous.

Rio Janeiro, Glaziou nr. 1781 (H, RB), 2351 (H, RB, Rg, W); Organ Mts., Gardner nr. 189 (B, fragm.).

2. f. *glandulosa* (Ros.) — *D. villosa* var. *glandulosa* Rosenst. Hedwigia **46**: 129. 1906. — *A. consobrinum* Fée l. c. — Underside densely and finely glandular; long hairs on veins more numerous. Indusia large, glandular.

Rio Janeiro, Glaziou nr. 2350 (H, Rg). — Rio Grande do Sul, Rio Pardo, Jürgens ed. Rosenst. Fil. exs. austrobras. nr. 206 (B, R, Rg, W).
São Paulo: Campinas, A. Heiner s. n. (S.).
Paraguay: in regione cursus superioris fluminis Y-acá, Hassler nr. 6898 (B, RB).

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5. Group of **D. protensa.**

349. **Dryopteris protensa** (Afz.) C. Chr. Ind. 286. 1905.

Syn. *Aspidium protensum* Afzelius; Sw. Schrad. Journ. **1800**[2]: 36. 1801; Syn. 51.
Aspidium subquinquefidum Pal. Beauv. Fl. d'Oware et Bénin **1**: 34 t. 19. 1804
(for other synonyms see Ind. Fil.).

Type from Sierra Leone, Trop. W. Africa, leg. Afzelius (S! and several specimens in U!).

D. protensa is the best-known member of a group of African ferns that all have been referred by some authors to *D. protensa* (resp. *D. subquinquefida*), while others have created a number of species. Lacking sufficient material I shall not try here to clear up the real nature of these African forms, but a minute comparison between them and very similar forms occurring in America was necessary for settling the question, whether the American plants belong to the same species as the African ones or not. I have arrived at the conclusion that the common American form cannot be separated from *D. protensa* as a species, but there are some small differences so that I find it justifiable, at least provisionally, to name the American plants:

var. **funesta** (Kze.) C. Chr. Ind. 286.

Syn. *Aspidium funestum* Kunze, Linnaea **9**: 96. 1834; Mett. Aspid. no. 169.
Nephrodium funestum Hook sp. **4**: 129 tab. 259. 1860; Jenman, W. Ind. and Guiana Ferns 219.
Aspidium cicutarium Willd. sp. **5**: 215 (part.?) 1810 (non Sw. 1801); Kze. Flora **1839**[1]: Beibl. 33, Kl. Linnaea **20**: 371. 1847.
Aspidium acrocarpon Fée, 11. mém. 84. 1866.
Type from (N.?) Brazil: Ega, leg. Poeppig (not seen).

In habit, colour, texture, pubescence, venation etc. the variety does not differ from the African form, but it is as a rule larger, the stipe and rachis furnished with several small entire fibrils that are very few or absent in true *D. protensa*. The sori are generally small, supramedial or almost submarginal and covered with firm, persistent indusia, while the sori of *D. protensa* are larger, rather medial and their indusia

smaller, deciduous. The scales of the rhizome are brighter than those of *D. protensa*. The differences here pointed out are as a rule found between the variety and *D. protensa* but they are sometimes scarcely observable. KLOTZSCH (loc. cit.) mentions a difference in pubescence: *D. protensa* has articulated hairs, the variety not; this difference does not exist; both have all ribs rusty-pubescent with common *Ctenitis*-hairs, and hairs of any other kind are never found. *D. protensa* has, it is true, generally several longer articulated hairs on the ribs above, which are not found in most specimens of var. *funesta*, but they exist in younger, well-preserved fronds.

D. protensa with its variety is so well-known and so often described and figured that a new description is unnecessary. By its creeping rhizome, quinquangular lamina and broad, obtusely rounded segments it is abundantly different from all other American species of *Dryopteris*. It is clearly a member of the subgenus *Ctenitis*, within which with its African allies it forms a separate section. I hope I shall later on be able to dealing in some detail with this section and to prove its real affinity.

D. protensa var. *funesta* is just as variable in America as is the true *D. protensa* in Africa. It varies in size and especially in degree of division. Some specimens have the middle pinnæ pinnatifid only with all secondary pinnulæ decurrent and confluent at base and often fully entire or at best slightly crenate or lobed at the anterior side. From this, the most simple form, the basal pinnæ of which are nearly as long as the central part of the frond, all possible transitions are found to large forms with longer central part and with the middle pinnæ bipinnatifid with all pinnulæ free and nearly or quite incised to the midrib into broad tertiary segments which again are sometimes crenated or lobed. Such large forms are found in about all localities together with the smaller ones. A still more divided form is mentioned below. *Aspidium acrocarpon* Fée differs a little from the common form by its sori being nearly terminal on a vein, which, however, occurs occasionally in several specimens.

D. protensa var. *funesta* has its head-centre in the Guiana-lowlands and Trinidad, where it is a very common fern; it goes south to North-Brazil and is besides found in much scattered localities as Guadeloupe, and Martinique, Sto. Domingo and Panama.

Sto. Domingo, MAYERHOFF (B = *A. acrocarpon* **Fée, leg. TUSSAC, not seen**).

Guadeloupe, L'HERMINIER **nr. 160** (B, RB), MAZÉ **nr. 305** (B), **Père DUSS nr. 4053** (RB, W).

Martinique, Père DUSS nr. 1583 (RB).

Trinidad, FENDLER **nr. 16** (B, Rg, RB, W), Bot. Gard. Herb. nr. 140, 322, 323, 3757, 6058, 6282 (B, R, W), BROADWAY, nr. 2850, 2851, 2313 (RB), HITCHCOCK nr. 10385 (W) and others.

Guiana, British G., SCHOMBURGK **nr. 16** (RB), 1178, 1203 (B), APPUN **nr. 10** (B), JENMAN **nr. 402** (B, RB). — Dutch G., HOSTMANN & KAPPLER ed. HOHENACKER **nr. 64** (B, RB), J.KNYPER (W). — French G., LEPRIEUR (B, W), SAGOT **nr. 725, 725 bis** (B, RB), RICH (CC).

Panama: Canal Zone, MAXON **nr. 4896** (CC, W). Cana, WILLIAMS **nr. 866** (W).

Brazil: Brazilian Guiana, Huber nr. 751, 1064, Alto Amazonas, Martius nr. 321 (B, RB), Pará, Stübel nr. 1140 (B), Bahia, Blanchet nr. 2485 (B, CC, RB), Luschnath nr. 114 (B), Matto Grosso, Grillos, Lindman nr. A. 3251 (Rg, S, U). Ilheos Riedel (Rg, RB): without locality Glaziou nr. 10187 (H), 15757 (B, H).

var. **dicksonioides** (Fée).

Syn. *Aspidium dicksonioides* Fée, Cr. vasc. Brés. **1**: 148 t. 49 f. 1. 1869.

The most divided form, apparently very different from the more common var. *funesta*, but it is connected with it by some of the larger forms mentioned above. It is fully quadripinnate below, quadripinnatifid at the middle, the free tertiary pinnulæ of a middle pinnæ being again pinnatifid or lobed on the anterior side. Underside rather glandular by glistening, sessile glands. Such glands are occasionally found in the var. *funesta* but they are always few. Sori near the margin. — This variety is a parallel to the African *Nephrodium variabile* Hook. sp. **4**: 135, but I cannot follow Hooker in considering it identical with it; the position of the sori is different and there are other differences.

Brazil: Amazonas, San Gabriel, Spruce nr. 2129 (Kew. — Fée by a mistake quotes Glaziou nr. 2129). French Guiana, Leprieur nr. 8 (B, W — less glandular).

Subgenus X. Parapolystichum Keyserling emend. C. Chr.

Polystichum § Parapolystichum Keyserling, Pol. Cyath. Herb. Bung. 11, 45. 1873.

Rhizome short-creeping; lamina often large, deltoid, tripinnatifid to quadripinnate, thin or chartaceous, catadromous in its secondary divisions, variable in the tertiary, but ultimate pinnules more or less polystichoid in habit, i. e. their posterior basal segment being somewhat reduced with the lower base cuneate and decurrent, forming a narrow wing to the costa, the anterior basal segment enlarged; margins acutely toothed. Scales of lamina few or none, those of the rhizome thin, often large. Simple, whitish hairs absent but costæ and costules (*D. acuta* excepted) shortly tomentose with articulated hairs similar to those of *Ctenitis*, and longer septate hairs may be found on the ribs beneath; underside, especially on the ribs, furnished with few or many red or yellow, cylindrical, glandular hairs which often resemble certain eggs of insects. Sori small, indusiate or not; sporangia small, on long pedicels which bear a stalked capitate or oblong gland. Spores coarsely verrucose. — The rachis often produces at the axil of an upper pinnæ a scaly bud from which small leaves grow out; sometimes buds are produced on the midribs of the pinnæ.

This subgenus has the articulated hairs in common with *Ctenitis*, the more or less polystichoid habit in common with *Polystichopsis*, but it cannot naturally be united with either of these subgenera, at least not with *Ctenitis*, from which it differs in

habit, gemmiferous rachises, spores, sporangia and other characters. *D. acuta* is rather different from the two other species and approaches *D. amplissima*, but its cylindrical hairs and gemmiferous rachis seem to indicate its right position being here.

I do not know any species of the Old World that is closely related to *D. effusa*, the type-species of *Parapolystichum*, still, it is possible that *D. Wardii* (Bak.) and *D. Hornei* (Bak.), both from the Seychelles, should be referred to this subgenus.

Key.

1. Costæ and costulæ above with short tomentum in a furrow. 2
— Costæ and costulæ above glabrous; rachises rather scaly. Sori indusiate. Underside with yellow, cylindrical hairs. 350. *D. acuta* (Mett.) C. Chr.
2. Sori indusiate. Smaller Andine species. 351. *D. exculta* (Mett.) C. Chr.
— Sori exindusiate. Often large. 352. *D. effusa* (Sw.) O. Ktze.

350. **Dryopteris acuta** (Kl.) O. Ktze. Rev. Gen. Pl. **2:** 812. 1811. — Fig. 20.

Syn. *Lastrea acuta* Kl. ms. — *Nephrodium acutum* Hook. sp. **4:** 147 pt. (excl. tab. 171). 1862; Hook. and Bak. Syn 286.

Type from Brazil, leg. SELLOW (B! Kew!).

Rhizome creeping, 6—8 mm thick, paleaceous; scales lanceolate, entire, scarcely more than 1 mm broad. Stipe brownish-stramineous with several small, deciduous scales like rachis, which produces a bud below the apex. Lamina probably more than one meter high, firm, nearly coriaceous, glossy above, quadripinnatifid at base, tripinnatifid at the middle, in cutting agreeing with *D. effusa*. Basal pinnæ the largest, much produced downwards, long-stalked; middle pinnæ up to 35 cm long, lanceolate, acuminated with a serrated, sharply acute apex. Pinnulæ distant, lanceolate, acuminate-mucronate, shortly narrowed towards the base, decurrent, pinnatifid about $^2/_3$ of the way down into falcate, sharply acute, close segments, the larger of which are obliquely toothed, the posterior basal one reduced, and broadly adnate-decurrent to the costa. Rachises rather scaly by small, lanceolate, brown, entire scales. Upper surface, incl. costæ and costulæ quite glabrous, underside with scattered, as fresh bright-yellow short and thick cylindrical hairs. Veins simple, oblique. Sori a little supramedial. Indusia rather deciduous, reniform, with many yellow, cylindrical hairs.

D. acuta connects *D. effusa* with *D. amplissima* and is less divided than both. Its affinity with *D. effusa* is shown by the bud on the rachis and the kind of division, i. e. the first pinnula of a middle pinna is the basiscopic one, but it differs by its

glabrous costæ and costulæ, by its scaly rachises and indusiate sori.

This distinct species is apparently rare and perhaps confined to the north-eastern provinces of Brazil where it was collected by Sellow (Campos Vittoria, no. 7332) and Goeldi (RB, Parahyba) and once by Glaziou no. 15758 (B).

351. **Dryopteris exculta** (Mett.) C. Chr. comb. nov.

Syn. *Aspidium excultum* Mett. Aspid. 69 no. 162 tab. 17 fig. 9. 1858.

Nephrodium excultum Hook. sp. 4: 148. 1862, excl. syn. and most localities.

Dryopteris effusa **exculta* C. Chr. Ind. 263. 1905. Hieron. Hedwigia 46: 348.

Aspidium laetum Moritz, Bot. Zeit. 1854: 855 (nomen, non Sw. 1817).

Aspidium radicans Fée, Gen. 294. 1852 (ex descr., not *Dryopteris* Maxon 1908).

Type from Venezuela, Tovar, in nemoribus, locis saxosis subapertis, Moritz no. 433 (B!).

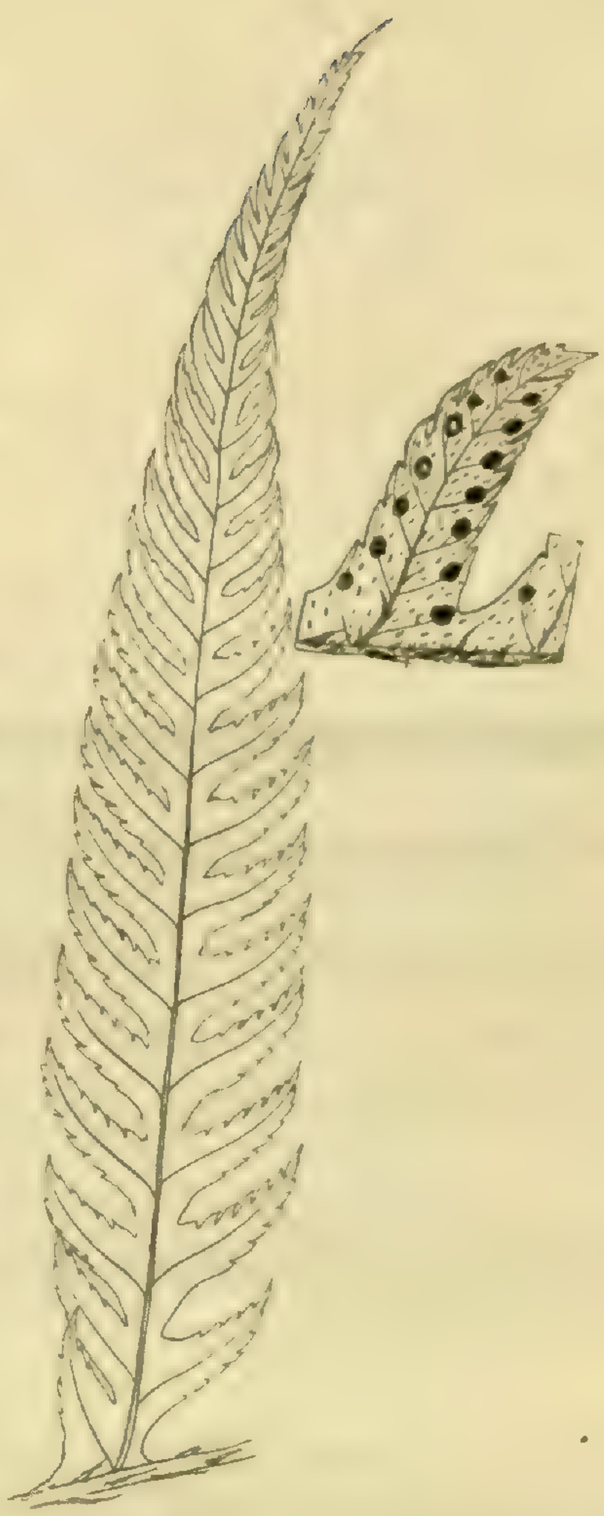

Fig. 20. *D. acuta* (Kl.) O. Ktze. Secondary pinnula from basal pinna, nat. size, and tertiary segment, × 2.

Closely allied to *D. effusa*, especially its var. *divergens*, which it resembles in most characters: rhizome, scales, division of lamina and kind of pubescence, but it can at once be distinguished from all forms of *D. effusa* by its sori being persistently indusiate; indusia rather large, red-brown, glabrous. Other but less reliable differences from *D. effusa* is the shape of the lamina, that is commonly ovate-elongated, long and gradually attenuated from a broad base towards the apex, not broadly deltoid as *D. effusa*. The rachis produces a scaly bud shortly below the apex. Lamina chartaceous, brownish dark-green when dried (*D. effusa* var. *divergens* greyish green), up to 50 cm long, 30 cm broad below, generally tripinnatifid, in cutting very similar to *D. effusa* var. *divergens*, still the basal secondary pinnules are more broadly ovate; tertiary segments subacute. Underside, especially along the veins and between the sporangia, furnished with short, thick, cylindrical, yellowish hairs, which probably are glands with the juice dried out; rachises II are very sparsely pubescent beneath, mostly so towards their base (as in *D. effusa typica*).

Venezuela: Tovar, Moritz nr. 433 (B, RB).
Colombia: Fusagasuga, Stübel nr. 503 (B); Popayan, Lehmann s. n. (CC, RB).

var. **guatemalensis** (Bak.).

Syn. *Nephrodium guatemalense* Bak. Syn. ed. II. 498. 1874!
Dryopteris guatemalensis Ktze. 1891; C. Chr. Ind. 269.
Aspidium guatemalense Christ, Bull. L'Herb. Boiss. II. 6: 56. 1906 cum descr.
Nephrodium xanthotrichium Sod. Rec. Cr. vasc. quit. 52. 1883; Cr. vasc. quit. 255!

Differs mainly from typical *D. exculta* by its smaller size (lamina rarely more than 30 cm long by 10—15 cm broad, often smaller), by its narrower secondary pinnules (scarcely 1 cm broad) and by its sharply acute tertiary lobes. Pûbescence variable; most often the under surface is rather densely glandulose by thick, shining, red, glandular hairs that become pale-yellow when the juices dry out, and the rachises beneath are shortly pubescent by patent hairs, but in some specimens both glands and hairs are very few or totally absent. — *N. guatemalense* Bak. and *N. xanthotrichium* Sod. are to me quite identical. — Some specimens from Costa Rica—Panama come very near to typical *D. exculta*.

Mexico: Chiapas, Ghiesbregth nr. 422 (Kew).

Guatemala: Choelum (?), Salvin and Godman 1862 (Kew, type of *N. guatemalense* Bak.); Alta Verapaz, Cubilquitz, v. Türckheim ed. J. D. S. nr. 8820 (RB, W — distributed as *Nephrodium acutum* Hook.); nr. II. 1088 (W), II. 1444 (RB).

Costa Rica: Llanuras de Santa Clara, Donnel Smith nr. 6896, 6907 (W, both distributed as *Nephrodium patulum* Bak.); Pedra del Convento, Pittier nr. 3548 (B, W); El General, Pittier nr. 10648 (W), Los Palmares, Pittier nr. 10645 (W); Forêts de Tuis, Tonduz nr. 11337 (W); Navarro, Wercklé (W); Juan Viñas, Reventazon Valley, Cook and Doyle nr. 385 (W); Puerto Viejo, Pittier nr. 6928 (W, RB); Cerro Turubales, A. et C. Brade nr. 407 (R).

Panama: Cana, Williams nr. 880 (W); Porto Bello, Maxon nr. 5742? (W).

Colombia: Bugava, Chiriqui, Lehmann s. n. (CC, RB).

Ecuador: Chimborazo, Spruce nr. 5722 Kew); ad flumen Peripa, Sodiro (Kew, type of *N. xanthotrichium* Sod.).

var. **squamifera** n. var.

Differs from all forms of *D. effusa* and *D. exculta* by its primary and secondary rachises being rather densely paleaceous by lanceolate, subentire, red-brown, thin scales; by its indusiate sori and glandulose underside it agrees with var. *guatemalensis*.

Costa Rica: Navarro, Wercklé nr. 16741, 16753, 16764 (RB).

Obs. Fournier has referred some specimens from South Mexico to *Aspidium Trianae* Mett. (Mex. pl. I) which probably should be referred to *D. exculta*; a fragment of one of the quoted specimens (Ghiesbregth nr. 83 from Oxaca) belongs no doubt to this or a closely related species, very different from *D. Trianae*. It is larger than var. *guatemalensis* and without cylindrical hairs beneath.

352. **Dryopteris effusa** (Sw.) Urban, Symb. Ant. 4: 16. 1903; C. Chr. Ind. 263.

Syn. *Polypodium effusum* Sw. Prodr. Fl. Ind. occ. 134. 1788; Fl. Ind. occ. 1690. Schkuhr, Kr. Gew. 27 t. 26 c.

Nephrodium effusum Bak. Syn. 287; Jenm. Bull. Bot. Dept. Jamaica n. s. 3: 111. 1896; W. Ind. and Guiana Ferns 225.

Polypodium multifidum Jacq. Coll. 3: 187. 1789; Ic. pl. rar. tab. 643.

Polypodium miser Hew. Mag. Nat. Hist. II. 2: 460. 1838, ex descr.

Polypodium dilatatum Liebm. Vid. Selsk. Skr. V. 1: 208. 1849!

Lastrea grandifolia Pr. Epim. 39. 1849!

Polypodium divergens Willd., Schkuhr, Kr. Gew. 27 tab. 26 b (1806?); Willd. sp. 5: 209!

Phegopteris divergens Fée, Gen. 243. 1850—52; Mett. Fil. Hort. Lips. 83. 1856.

Dryopteris ulvensis Hieron. 46: 346 tab. 7. fig. 18. 1907!

Type from Jamaica, leg. SWARTZ (B! H!) — Sloane, Jamaica tab. 57.

The typical form from Jamaica may be described as follows:

Rhizome strong, short-creeping, sometimes branched, at the apex clothed with several large, ovate or lanceolate, subentire or faintly toothed, generally appressed, yellow-reddish or brown, opaque, thin scales. Stipites approximate, up to 1 cm thick and 50—100 cm long, brownish or stramineous, below with some deciduous, ovate or lanceolate, rather large, thin scales, upwards as a rule naked and quite glabrous. Lamina deltoid, probably reaching one meter in length and breadth, thinly herbaceous to chartaceous, fresh green and shining above, 4-pinnate—5-pinnatifid, sometimes 6-pinnatifid below, smaller forms 3-pinnate. Rachises of I—III. order glabroŭs beneath, or, sometimes, stalks of secondary and tertiary pinnæ with several, patent, articulated hairs, above with a broad channel which is filled with a dense mass of very short, reddish hairs; primary rachis, rarely also the secondary, often with a scaly bud in the axil of an upper prima. Midribs of quaternary (tertiary) pinnæ above shortly glanduloso-pubescent, upper surface otherwise glabrous. Underside glandulose by scattered, short, cylindrical, red, shining glandular hairs. Pinnæ alternate, the basal ones the largest, up to 50 cm long, their lower side considerably produced; middle and upper pinnæ oblong, acuminate. Secondary pinnæ stalked, ovate-oblong, acuminate, somewhat unequal-sided, the anterior side being a little broader. Tertiary pinnæ of upper pinnæ (or quaternary pinnæ of basal primary pinnæ) with a winged, short petiole, oblong, 1—2 cm long, $^1/_2$—1 cm broad, the anterior basal one always the largest, all decurrent at the base, forming a distinct wing along the midrib of the secondary (or tertiary) pinnæ, their apices sharply acute, the margins more or less deeply pinnatifid into oblique or falcate, close, acute lobes, these entire or toothed, the larger ones shallowly lobed. Veins simply pinnate in the lobes, terminating shortly within the margin. Sori near the tip of the ultimate lobes, small, reddish, exindusiate; receptacle with several shining red glands

among the sporangia, which bears on its pedicel a rather large capitate, stipitate gland. Spores coarsely verrucose.

In Jamaica *D. effusa* is, says JENMAN, a common fern from the lowlands up to 5000 feet, and the specimens seen are rather uniform; still JENMAN points out that only the plants growing in higher elevations produce a bud on the rachis a few inches below the tip of the lamina. The same typical form is also found in Porto Rico and Sto. Domingo.

In some of the Lesser Antilles, Cuba, and on the continent from South Mexico to Peru and South Brazil *D. effusa* is represented by a series of forms, some of which are scarcely distinguishable from the type, while others seem rather different. I have tried to define some varieties, but I have failed to find good, constant characters. Most forms differ more or less from the type in texture, colour and pubescence; buds on rachis are found in all forms. It is possible to refer all specimens examined to one of the five groups, shown in the following arrangement, but this is entirely conventional, as several specimens could as well be referred to another group than that in which I have placed it.

Lamina	Pubescence
1. f. *typica* (*P. effusum* Sw.)	
dark green, rather herbaceous, 4-pinnate, 5-pinnatifid.	Cylindrical, shining glands spread over the under surface; rachises beneath without longer hairs.
2. *Pol. dilatatum* Liebm.	
Similar, sometimes more firm.	Cylindrical hairs fewer, mostly confined to the veins, often opaque; Rachises II—IV shortly pubescent beneath.
3. *Pol. divergens* Willd.	
Greyish dull-green, firm, 3-pinnate, 4-pinnatifid.	Cylindrical hairs absent or very few along the veins; rachises II—III rather pubescent beneath.
4. *Lastrea grandifolia* Pr.	
Dull-green, firm, 3—4-pinnate, 5-pinnatifid.	Cylindrical hairs few, opaque, along the veins; rachises II—IV glabrous or a little pubescent.
5. *Dryopteris confinis* Maxon.	
Dull-green, chartaceous or subcoriaceous, 2-pinnate—3-pinnatifid; small.	Cylindrical hairs absent, but underside sometimes with sessile glands; rachis II most often glabrous.

The best marked form is no. 3 which I have called var. *divergens* (Willd.) Hieron. on labels. In its typical form, represented by the original specimen of *P.*

divergens Willd. (B!) and other specimens from the northern Andes, it seems rather different from f. *typica*, with which it is, however, connected by intermediate forms referred to no. 2 and 4. Seldom it is quite without short, cylindrical, yellowish-brown, opaque hairs on the larger veins beneath; the midribs of the secondary and tertiary pinnules are, as a rule, rather densely and softly pubescent with articulated, patent, thin hairs. The firm, mostly greyish-green lamina is less cut; the broad uncut centre of the secondary pinnules gives it a rather different habit from the more finely cut. — The var. *confinis* is an insular, reduced form of var. *divergens*.

Below I enumerate only those specimens seen, which are furnished with a collector's number, sorting them under the five groups.

1. f. *typica* (*Pol. effusum* Sw.).

Jamaica: Eggers nr. 3762 (B, RB), 3792 (B, R, BB), Underwood 69, 1557, 2926 (W), Maxon nr. 786, 917, 1695, 2213, 2377, 2580, 2819 (W), Clute nr. 134 (W), J. Day nr. 7 (B, W), D. Watt nr. 61 (RB), Wilson nr. 210 (W), A. S. Hitchcock nr. 9602 d (W).

Porto Rico: Sintenis nr. 433 (B, RB), 2135 p. p. (B, RB, S, W), 2246 (B), 2420, 3048 (B, W), 4055 (B, RB), 4096 b, 6538 (B), Eggers nr. 6538 (R), A. A. Heller nr. 6254 (W), Percy Wilson nr. 277 (W), Hioram nr. 268 (W), Gundlach nr. 1399 (B), Schwanecke nr. 79 (B).

Sto. Domingo: Barahona, Fuertes nr. 756 (B, W), 1536 (B) — prope Constanza, H. v. Türckheim nr. 2977 (B, RB, Rg) — a form near var. *confinis*).

Surinam: Fairfield, Wullschlägel nr. 1150 (RB) — Locality possibly false. Jamaica?

2. (*Pol. dilatatum* Liebm.) — Intermediate between f. *typica* and var. *divergens*.[1]

Cuba occ. Ekman 1914 nr. 1320 (CC).

Mexico: Vera Cruz; Mirador, Liebmann (H, B): Barranca de Tenampa, Zacuapan, C. A. Purpus nr. 1979 (W), 3008 (B, W); Vallée de Cordova, Bourgeau nr. 2012 (B, H, RB, S, W); Mirador, R. Endlich nr. 1315 (B); H. Finck nr. 64 (W) — Sierra Madre, E. Langlassé nr. 900 (B).

Costa Rica: Juan Viñaz, Reventazon Valley, Cook and Doyle nr. 201, 206 (W); Forêts de Tuis, Tonduz nr. 11335, 11336 (RB, W), 11338 (RB); près S. Ramon, Herb. Ist. phys.-geogr. nat. costaric. nr. 14232 (W); Turrialba, A. et C. Brade nr. 351 (R).

Colombia: Llanos de San Martin, Villavicencio, Stübel nr. 631 (B = *D. xanthotrichia* (Sod.) Hieron. Hedwigia **46**: 348), Muzo, Stübel nr. 553 (B).

Ecuador an Rio Suguibi, Rimbach ed. Ros. Fil. ecuador. exs. nr. 41 (W): near Baños, Stübel nr. 848 (B, W = *D. ulvensis* Hieron).

3. var. **divergens** (Willd.) Hieron. Engl. Jahrb. **34**: 447. 1905 (*Pol. divergens* Willd.) — see above.

Martinique, Père Duss nr. 1581 (B, W); Sieber, Fl. mixt. nr. 351 (B).

St. Vincent; H. H. Smith nr. 862 (B — nearer f. *typica*).

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[1] *D. ulvensis* Hieron. that was erroneously referred to *Eudryopteris* in the first part of this monograph (p. 72 nr. 9) is a form of *D. effusa*, like *P. dilatatum* Liebm. intermediate between f. *typica* and var. *divergens*, with a rather firm lamina with very few cylindrical hairs and costules more broadly winged than in any other form.

Grenada, Sherring nr. 167 (B, W), J. W. Elliott s. n. (W).

Trinidad, Fendler nr. 45 (B, Rg, W); A. S. Hitchcock nr. 10387 (W); Bot. Gard. Herb. Trinidad nr. 317 (B, W), 318 (B, R, W).

Cuba, Wright nr. 831 pt. (B, RB, W); Yateras, Oriente, Maxon nr. 4232 (W).

Guatemala, Dept. Alta Verapaz: near the Finca Sepacuite, Cook and Griggs nr. 249 (W); Cubilquitz, v. Türckheim ed. J. D. S. nr. 7729 (B, R, W); Pansamalá, v. Türckheim ed. J. D. S. nr. 1052 (W, B) — edited under the false name *Nephrodium patulum* Bak.). — Dept. Santa Rosa: Volcan Tecuamburro, Heyde et Lux ed. J. D. S. nr. 4682 (B, RB, W) — sine loco, Heyde nr. 733 (W).

Honduras, Dept. Santa Barbará: San Pedro Sula, C. Thieme ed. J. D. S. nr. 5670 B (W); Rio Permejo, C. Thieme ed. J. D. S. nr. 5671 B (W).

Costa Rica: Cartago, J. J. Cooper ed. J. D. S. nr. 6030 (W); Bords du rio du Convento, Pittier nr. 10597 (W); près S. Ramon, Herb. Inst. phys.-geogr. nat. costaric. nr. 14255 (W); Navarro, Wercklé nr. 16742, 16745, 16754 (RB).

Colombia: Santa Marta, H. H. Smith nr. 1021 (Rg, RB); Muzo, Stübel nr. 534 (B); Putzú, Lehmann nr. LXXXVI (B); Alto del Trigo, La Vega, Lindig nr. 344 (RB).

Venezuela: Tovar, Fendler nr. 305 (B), Gollmer (B); Caracas, Bredemeyer (Herb. Willd. nr. 19725 (B, type of *P. divergens* Willd.).

Ecuador: Pallatanga, Spruce nr. 5602 (RB); Balao, Eggers nr. 14351 (W); Quito, Sodiro (RB, B), Fraser (B); Palulahua, Sodiro (RB); San Florencio, Stübel nr. 800 (B, RB).

Peru: Mt. Guayrapurima near Tarapoto, Spruce nr. 4663 (Kew, RB); Cumbassama Mts., Steere (RB).

Bolivia: Charopampa, near Mapiri, Buchtien nr. 1036 (R).

Paraguay: Cordillera de Altos, K. Fiebrig nr. 94 (B); Cordillère de Mbatobi, près de Paraguari, Balansa nr. 2909 (B, H).

4. (*Lastrea grandifolia* Pr.) — Hereto I refer all specimens from South Brazil, although some of them are scarcely different from var. *divergens*, while others by narrower segments, more glands and fewer hairs are intermediate between f. *typica* and var. *divergens*. Rachis is often bulbiferous. Presl described *L. grandifolia* as indusiate; I have, however, never found an indusium in the numerous specimens examined.

Brazil. Parahyba, Goeldi (RB) — Minas Geraes: Caldas, Regnell nr. II. 323 (Rg, U, W), Lindberg nr. 557 (B); Claussen nr. 128 = ed. Hohenacker nr. 2113 (B, CC, RB, U, W); Lagoa Santa, Warming nr. 794, 795 (H). — Rio Janeiro: Glaziou nr. 387, 2392 (H), Miers nr. 84 (RB), H. Schenck nr. 1771 (RB), and several others. — São Paulo: Serra de Carracol, Mosén nr. 2189 (H, L, Rg, S, U). Campinas, Heiner nr. 499 (S), Ribeira, Brade nr. 5113 (R); Bella vista ad Rio Pardo, Wettstein et Schiffner (RB = *Aspidium acutum* Christ, Denkschr. Ak. Wien **79**: 17). Matto virgem, Rio Claro, Löfgren nr. 654 (H). — Parana: Villa nova, Annies ed. Rosenstock. Fil. austr. bras. exs. nr. 77, 78 (B, R, BB, Rg, W); Tieté, Gerder nr. 92 (R). — Sta. Catharina: Peninsula da Gloria, E. Ule nr. 68 (RB); Pabst nr. 209 a (B); Rio Uruguay, Dusén nr. 11809 (Rg); Itacopú, Schwacke nr. 12977 (RB); Blumenau, Härchen nr. 4, 15 (R) and others (conf. Rosenstock: Hedwigia **46**: 130). — Rio Grande do Sul: S. Angelo, Lindman nr. A. 989 (L, Rg, S, U = *Nephrodium acutum* Lindm. Ark. för Bot. **1**: 226, non Hook.).

5. var. **confinis** (Maxon).

Dryopteris confinis Maxon in sched.; *Aspidium pubescens* var. *glabrum* Christ, Engl. Jahrb. **24**: 117.

A small, insular form with the lamina 20—40 cm long, basal pinnæ 10—15 cm long only, scarcely more than 2-pinnate—3-pinnatifid, but otherwise not essentially different from var. *divergens*. The dull-green, nearly subcoriaceous lamina is sometimes without hairs and glands beneath, still some specimens are pubescent as var. *divergens*, and others have rather many, sessile, shining glands spread over the underside.

The apex of the leaf is sometimes considerably elongated and bears a bud short below the tip. It is often confounded with *D. chœrophylloides*.

Cuba: Oriente, Wright nr. 831 pt. (B, RB, Kew, S, W), 1000 pt. (S); Linden nr. 1743 (RB). Monteverde, Eggers nr. 5109 (B, W); Gran Piedra, Maxon nr. 4053 (W); Santa Ana, Maxon nr. 4185 (W); Finca Las Gracias, Maxon nr. 4497 a (W). — Santiago: El Yunque near Baracoa, Palmer and Riley nr. 400 (R, W). — Pinar del Rio: near El Guama, Palmer and Riley nr. 401 (CC, W); San Diego de los Baños, Palmer and Riley nr. 564 (R, W); Sumidero, Shafer and Léon nr. 13653 (R, W).

Haïti, Picarda nr. 665 (B), 1679 (B, RB).

Subgenus XI. Polystichopsis (J. Sm.) emend. C. Chr.

Lastrea § Polystichopsis J. Smith, Hist. Fil. 217. 1875.

A most natural subgenus or genus including several middle-sized species, that have a short- or long-creeping rhizome (rarely nearly erect as in *D. denticulata*) and an ovate or deltoid lamina, varying from bipinnate-tripinnatifid to 5-pinnate—6-pinnatifid, anadromous in all divisions (habit polystichoid) (fig. 2), rarely, as in the less divided forms, partly catadromous, often rigidly coriaceous, never gemmiferous. Scales of lamina in most species few or none, rhizome always but rather sparsely paleaceous. Several species perfectly without hairs, others with short or long paucicellular hairs. Sori indusiate: indusia of the first group small, of the second often large, coriaceous, rotundato-reniform, sometimes almost peltate; sporangia without gland on the pedicel; spores verrucose or papillose.

This subgenus is, I think, more closely related to *Polystichum* than to *Dryopteris*; it includes a number of Old-World's species that now have been referred to the former, now to the latter, f. inst. *Polystichum aristatum* (Forst.) Pr. and *P. hispidum* (Sw.) J. Sm.; also *D. denticulata* and *D. amplissima* have been considered species of *Polystichum*. All these species differ chiefly from true *Polysticha* by their creeping rhizome, much dissected leaf and in the rarely truly peltate indusia. More studies will show, I

think, that *Polystichopsis* must be considered a natural genus between *Dryopteris* and *Polystichum*.

The American species of this subgenus fall into two groups:

1. Group of *D. pubescens*. Smaller species, less divided and less distinctly anadromous; long, soft hairs often numerous. Indusia small, early deciduous, often not found. (Species 353—356). To this group the name *Polystichopsis* was applied by J. Smith, but be consociated with *D. pubescens* some species (*D. protensa* and its allies), which are widely different. His distinguishing characters were the creeping rhizome and the decompound lamina. It is, however, justified to use his name in another sense, also including in the subgenus the second group, the species of which J. Smith referred to his *Polystichum § Tectaria* (sic!).

2. Group of *D. decomposita*. Decompound, generally coriaceous species with anadromous venation in all divisions, most often quite glabrous or slightly pubescent. Indusia large, coriaceous, often rotundato-reniform.

It is quite possible that the well-known *Polystichum adiantiforme* (Forst.) J. Sm. should be referred to the second group. I cannot for the present decide whether such a treatment would be a natural one, and I have, therefore, in this work excluded the said species. If a minute and comparative examination of all its characters should prove that it forms a natural genus with *Polystichopsis*, this must bear the name *Rumohra* Raddi.

A derivate of *Polystichopsis* of proportionally recent origin is *Maxonia* C. Chr. Smiths. Musc. Coll. 66[9]. 1916, which again leads to the more specialized genus *Polybotrya* with the species *P. osmundacea* H. B. W.; most other or all of the species in Index Filicum referred to *Polybotrya* are to be excluded from that genus.

Key to the Species.

1. Lamina, at least on rachises beneath, with long, soft, pluri-cellular hairs. 2
— Lamina without long hairs. 5
2. Long hairs scattered over the surfaces, most numerous on rachises and veins beneath. Smaller West-Indian species: lamina 10—30 cm long. 3
— Long hairs confined to the rachises beneath; lamina 50—80 cm high, coriaceous. Indusium large. 356. *D. ochropteroides* (Bak.) C. Chr.
3. Bipinnate-tripinnatifid. Indusium very early falling, thin, rarely found. 4.
— Tripinnate-quadripinnatifid. Indusium persistent. Lower side of basal pinnæ produced. 355. *D. lurida* (Jenm.) Und. et Maxon.
4. Lamina bright-green, softly to firmly herbaceous. Secondary pinnæ of middle pinnæ 5—7 mm broad, 8—12 mm long; lower side of basal pinnæ not or a little produced only. 352. *D. pubescens* (L.) O. Ktze.
— Lamina dark-green, chartaceous. Secondary pinnæ of middle pinnæ 10—15 mm

broad, 2—3 cm long; lower side of basal pinnæ considerably produced (see also *D. pubescens* var. *muscosa*). 354. *D. chaerophylloides* (Poir.) C. Chr.

5. Lamina broadly lanceolate, large, bipinnate-tripinnatifid; lower basal pinnula of the basal pinnæ shorter than the following. 357. *D. Trianae* (Mett.) O. Ktze.
— Lamina deltoid, 3—5-pinnate (of *D. denticulata* **laeta* tripinnatifid); lower basal pinnula of basal pinnæ much the largest. 6.
6. Basal scales castaneous, rather rigid. 7.
— Basal scales reddish or yellowish, soft; teeth of ultimate segments obtuse. 11.
7. Large; lamina 40—70 cm high or more, 3-pinnate—4-pinnatifid, rigidly coriaceous; tertiary pinnules of middle pinnæ decurrent, confluent with a wing to the costa. 8.
— Smaller; lamina 10—40 cm each way; tertiary pinnulæ not decurrent. 9.
8. Rachises without scales. 358. *D. macrostegia* (Hook.) O. Ktze.
— Rachises with brown, toothed scales. 359. *D. amplissima* (Pr.) C. Chr.
9. Lamina rigidly coriaceous, 5-pinnate; ultimate segments not more than 1—1½ mm broad. 10.
— Lamina membranous to subcoriaceous, ultimate segments ovate-oblong, 2—4 mm broad; teeth aristate or sharply acute. 360. *D. denticulata* (Sw.) O. Ktze.
10. Ultimate segments sharply acute. 361. *D. rigidissima* (Hook.) C. Chr.
— Ultimate segments obtuse or subacute. 359. *D. denticulata* var. *dissecta* (Fée).
11. Small, andine species; lamina 10—15 cm long, 4-pinnatifid. 362. *D. leucostegioides* C. Chr.
— Larger lamina 30—40 cm long, 4-pinnate—5-pinnatifid. Cuba. 363. *D. formosa* (Fée) Maxon.

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353. **Dryopteris pubescens** (L.) O. Ktze. Rev. Gen. Pl. **2**: 813. 1891. — Fig. 21.

Syn. *Polypodium pubescens* L. Syst. ed. X. **2**: 1327. 1759.
Aspidium pubescens Sw. 1801; Mett. Aspid. 70.
Nephrodium pubescens Desv. 1827; Hook. et Grev. Ic. Fil. tab. 162 (good!); Jenman, Bull. Dept. Jam. n. s. **3**: 100. 1896.
Type from Jamaica, leg. Patrick Browne (not seen).

Under the name *D.* (resp. *Aspidium* or *Nephrodium*) *pubescens* most authors have united a series of West-Indian ferns, which, I think, can safely be referred to at least three distinct species. These having most characters in common I confine myself to describe in full the true *D. pubescens* and under the two following species to mention only their differentiating marks. As the true *D. pubescens* I understand that Jamaican fern well figured by Hook. and Grev., and which is represented by several specimens in W.

Rhizome creeping, about 5 mm thick, furnished with some few brown, lanceolate scales, the roots tomentose. Stipites rather close, fusco-stramineous, slender, 15—20 cm long, towards the base slightly scaly and tomentose by woolly, pluricellular hairs, upwards with similar, but fewer, patent hairs, at least subglabrous.

Lamina ovate or ovate-elongate, 15 cm long, 10 cm broad or smaller, seldom larger, herbaceous or thinly chartaceous, light-green, bipinnate, tripinnatifid, small forms often bipinnatifid only, the acuminate apex lobed. Primary and secondary rachises densely tomentose by long soft, whitish pluricellular hairs, above with a deep furrow filled with shorter hairs; margins and surfaces, especially along the veins with scattered similar, long hairs, and the lower surface sparsely glandulose by minute, pale yellowish glands. Pinnæ alternate, shortly petiolate, generally upcurved, from an unequal base gradually attenuated towards the short mucronate apex. Basal pinnæ not much larger than the following pair, their lower side not or little produced. Secondary pinnules of middle pinnæ 6—10 to each side, 8—12 mm long, 5—7 mm broad the lower short-stalked, the upper decurrent, the upper basal one the largest, parallel to rachis, the lower basal one much smaller, very oblique; pinnules ovate or ovate-oblong, sharply acute, their posterior base excised cuneate, the anterior one nearly parallel to the midrib of the pinnæ, the anterior margin obtusely dentate or subentire, the posterior one often deeply lobed with the basal lobe the largest; lobes broad, triangular, subacute. Veins of pinnules pinnate, the lateral ones furcate or, in the lobes, subpinnate, not reaching the margin, soriferous near their tips. Sori small, seldom more than 1 mm broad; indusium very small, delicate, early falling, rarely found. Sporangia glabrous, intermixed with long hairs. Spores coarsely verrucose.

Fig. 21. Basal pinnæ, nat. size, of *D. pubescens* (L.) O. Ktze. (the smaller) and var. *muscosa* (Vahl) (the larger).

This species varies in Jamaica mainly in size; a little form with lanceolate-elongated fronds is the var. *breviculum* Jenman (l. c.).

Jamaica, common in damp woods among the lower hills (Jenman). Maxon nr. 823 (W), 1465 (CC, W = Underwood nr. 2479), 1721 (CC, W = Underwood nr. 2685), 1752 (W = Underwood nr. 2714), 2787 (W); Underwood nr. 1593 (W, RB); Hillebrand nr. 223 (B); M. D. Watt nr. 139, 180 bis (R).

Cuba orient. Wright nr. 815 (B); El Porvenir, Trinidad Mts., Santa Clara, N. L. Britton and Percy Wilson nr. 5295 (W).

var. **haïtiensis** n. var.

Lamina ovate-lanceolate, long acuminated, 15 cm long, 6—8 cm broad at the middle, on a stalk up to 25 cm long, rather firm in texture. Indusia persistent, reniform, furnished with some long hairs.

Haïti prope Furcy, PICARDA nr. 277, 733 (B).

var. **muscosa** (Vahl). — Fig. 21.

Syn. *Polypodium muscosum* Vahl, Ecl. Amer. **3**: 54. 1807!; Willd. sp. **5**: 203. 1810!

Phegopteris villosa Fée, 11 mém. 53. 1866!

Differs from the type mainly by its larger and decidedly deltoid lamina, by which character it resembles the following species, but by its light-green colour, soft texture, the glands of the under-surface and denser pubescence it must naturally be consociated with *D. pubescens* rather than with *D. chærophylloides*. Moreover the lower side of the generally considerably enlarged basal pinnæ is only a little more developed than the upper side. Its distribution in the central Lesser Antilles, where neither *D. pubescens* type or *D. chaerophylloides* occur, might seem to indicate that it is a valid species, intermediate between the two others; a specimen from Jamaica (HART 185), however, is nearly identical with specimens from Martinique and Guadeloupe.

Montserrat, RYAN nr. 25 (H, type of *P. muscosum* Vahl).

Guadeloupe, L'HERMINIER nr. 121 (Herb. COSSON, Paris, type of *Ph. villosa* Fée, B, RB); Père DUSS nr. 4408 (W); MAZÉ nr. 345 (B); ENGELMANN (B).

Martinique, Père DUSS nr. 1582 (B, W), 1683 (B); HAHN nr. 915 (B).

Trinidad, Don (L).

Jamaica, H. H. HART nr. 185 (W).

Venezuela: Island of Marguerita, Juan Griego trail, J. R. JOHNSTON nr. 195 (H, W).

354. **Dryopteris chaerophylloides** (Poiret) C. Chr. comb. nov. — Fig. 22.

Syn. *Polypodium chaerophylloides* Poiret, Enc. **5**: 542. 1804.

Polypodium portoricense Spr. Nova Acta **10**: 230. 1821.

Phegopteris Portoricensis Fée, Gen. 243. 1850—52; Mett. Asp. u. Pheg. 14 nr. 17 cum descr.

Aspidium pubescens var. *sericeum* Mett.; Krug, Engl. Jahrb. **24**: 117 (not *Phegopteris sericea* Mett.).

— an *Nephrodium chaerophylloides* Desv. Prodr. 261. 1827?

Type from Porto Rico, not seen, but the original description agrees very well with the numerous specimens from that island seen.

Larger than *D. pubescens*. Stipe rather strong, tomentose beneath, nearly glabrous upwards. Lamina decidedly deltoid, about 20 cm long and broad or broader, tripinnate at base, bipinnate—tripinnatifid at the middle. Basal pinnæ much the largest, up to 20 cm long, with their lower side much produced. Secondary pinnulæ of middle pinnæ on stalks 3—5 mm long, ovate-oblong, $2^1/_2$—$3^1/_2$ cm long, 1—$1^1/_2$ cm broad, or still larger, submucronate, the larger ones sublobate or broadly serrated, the lobes oblique, subacute. Texture chartaceous, colour dark-green. Pubescence about as in *D. pubescens*, but generally less dense; the long hairs of rachis and surfaces are with age deciduous, while the secondary and tertiary rachises beneath are densely pubescent with short hairs; the deep furrows of the rachis and midribs of pinnæ are filled with a dense, short pubescence. Under surface without glands. Mature sori 2 mm broad, the sporangia intermixed with some, deciduous long hairs. Indusium not seen, but probably it is present in young stages.

Fig. 22. Lower half of a basal pinna of *D. chærophylloides* (Poir.) C. Chr., nat. size.

In its general habit the typical form of this species is very different from *D. pubescens*, owing to its decidedly deltoid, dark-green lamina and its broad pinnulæ, but in most minute characters it scarcely differs. It is evidently a common fern in Porto Rico, and a very similar form occurs in Eastern Cuba, where it may be confounded with *D. effusa* var. *confinis*, from which it differs clearly in pubescence.

Porto Rico: Eggers nr. 1340 (B, R, RB, W), Sintenis nr. 435 (B, R, S, W), 435 b, 437 (B), 2013, 2112, 2702 (B, W), 2849, 6033 b, 6065 b (B), 6537 (B, R); A. A. Heller nr. 4557 (W); Mr. and Mrs. A. A. Heller nr. 883 (B, W); Hioram nr. 119 (R, W); J. R. Johnston nr. 149 (W); Elis. G. Britton and Della W. Marble nr. 638, 1082 (W); Garber nr. 80 (B); L. Krug nr. 1407 (B); J. Gundlach nr. 1375 (B); O. Kuntze nr. 429 (B).

St. Croix, Benzon (H).

Jamaica: St. Georges, Portland, W. Harris nr. 7488 (B)

Cuba: Monte Verde, WRIGHT nr. 1000 (B, CC, S); Sierra Maestra, LINDEN nr. 1743 (RB); Finca las Gracias, Yateras, MAXON nr. 4469 (W); El Yunque near Baracoa, POLLARD et PALMER nr. 148 (W); La Perla, J. A. SHAFER nr. 8600, 8807 (W); Monte Verde, EGGERS nr. 5109 (RB, not B). — All localities in East Cuba.

355. **Dryopteris lurida** (Jenm.) Und. et Maxon; Slosson, Bull. Torr. Club **40**: 183 pl. 3 fig. 1. 1913.

Syn. *Nephrodium luridum* Jenman ms.

Type from Jamaica, leg. JENMAN (cotype in W!).

Well described and illustrated by Miss SLOSSON. It differs from *D. pubescens* by its larger, deltoid lamina (on a very long stipe) with the lower side of the basal pinnæ much produced, from *D. chærophylloides* by its light-green colour, rather herbaceous texture and glandular under-surface, from both by its more dissected lamina, which is nearly 4-pinnate below, at least 3-pinnate at the middle, and by its persistent indusia. The rhizome is thicker with the stipites close, sometimes fasciculated. In pubescence it agrees with *D. pubescens*. Pinnules and segments subacute.

Jamaica: Mount Diabolo, MAXON nr. 1957, 2311, 2260 (W, H, CC, Rg). UNDERWOOD nr. 1825 (W).

f. **leucochaete** (Slosson). — *Dryopteris leucochaete* Slosson, Bull. Torr. Cl. **40**: 184 pl. 3 f. 2. 1913.

I cannot agree with Miss SLOSSON in considering this form specifically different from *D. lurida*. The scales of the rhizome are paler and thinner, and the indusia is hairy, but the scales are variable in colour and I find, although rarely, some few hairs on the indusia of true *D. lurida*.

Jamaica: Peckham Woods, Clarendon, HARRIS nr. 11023 (W); near Troy, MAXON nr. 2860 (W, H).

var. **sericea** (Mett.). — Fig. 23 — (not *Dryopteris sericea* C. Chr. Bot. Gaz. **56**: 336. 1913).

Syn. *Phegopteris sericea* Mett.; Eaton, Mem. Amer. Acad. n. s. **8**: 208. 1860.

Polypodium sericeum Hook. sp. **4**: 258. 1862.

Fig. 23. *D. lurida* var. *sericea* (Mett.). Basal pinna of a smaller leaf, nat. size, and secondary pinnula, × 2.

A critical and apparently very rare form, of which I have seen only two specimens of the type-collection. Its position is uncertain, and only eventual additional specimens may settle the question, whether it is a valid species or a variety of *D. lurida*, under which I place it. As to shape and division of lamina it is nearly exactly identical with *D. lurida* and also in most other characters; it differs by its very numerous long hairs on both surfaces, and by its exindusiate sori; at least no indusium is found.

Cuba orient. WRIGHT **nr. 1054 (B, Kew.).**

356. **Dryopteris ochropteroides** (Baker) C. Chr. Ind. 280. 1905. — Fig. 24.

Syn. *Nephrodium ochropteroides* Bak. Ann. of Bot. 5: 325. 1891; Jenm. Bull. Bot. Dept. Jamaica n. s. 3: 110. 1896; W. Ind. and Guiana Ferns 224.
Nephrodium popayanense Hieron. Engl. Jahrb. 34: 447. 1904.
Dryopteris popayanensis C. Chr. Ind. 285. 1905.

Type from Jamaica: Fox's gap, HART 1886 (Kew!).

Rhizome shortly creeping, about 1 cm thick, densely clothed with brown, glossy, lanceolate, long acuminate, entire scales, 1—2 cm long. Stipe 50 cm or more long, downwards densely paleaceous and lanose by soft, long, pluricellular hairs, upwards sparsely scaly, the scales deciduous and leaving small, raised scars, the stipe becoming muricate. Lamina deltoid, up to 50 cm or more long and broad, 4-pinnate—5-pinnatifid, coriaceous, grey-green, without glands but rachises II—III beneath densely pubescent by whitish or brownish, patent and crisped, pluricellular, long hairs, above, like rachis I, narrowly channelled with shorter hairs in the channels, otherwise glabrous. Shape of pinnules and segments about as in *D. effusa*, but rachises II—III not winged; ultimate segments or lobes acute or very shortly mucronulate. Sori covered by large, reniform, subpersistent, sparsely ciliate indusia.

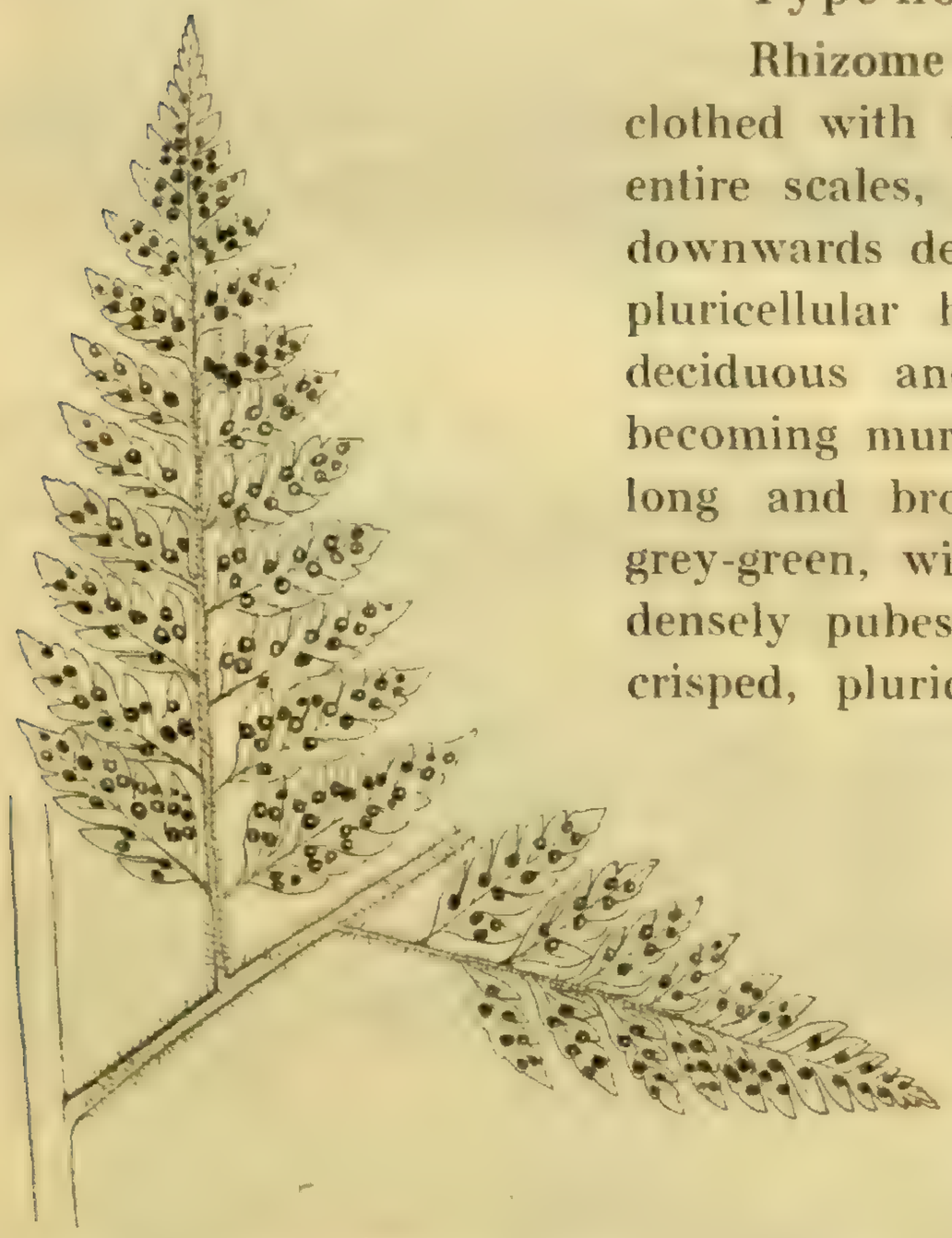

Fig. 24. ***D. ochropteroides*** **(Bak.) C. Chr. Basal secondary pinnulæ of a middle pinna, nat. size.**

Somewhat like *D. effusa* var. *divergens*, but very distinct by its coriaceous, grey-green, not gemmiferous lamina of anadromous division without glands and cylindrical hairs, by its large indusia and by its dense pubescence of long hairs of the rachises beneath, by which last

character it approaches *D. pubescens.* — *N. popayanense* is nearly typical; its scales are slightly toothed and the indusia glabrous.

Jamaica: Hart (Kew, RB); Moody's Gap, M. D. Watt nr. 17 (RB, CC); Rose Hill Wood, Bot. Dept. Jam. nr. 10828 (W).

Panama: Cerro de Garagará, Southern Darien, H. Pittier nr. 5657 (W).

Colombia: Popayan, Lehmann nr. 6960 (B, type of *N. popayanense* Hieron.).

357. **Dryopteris Trianae** (Mett.) O. Ktze. Rev. Gen. Pl. **2**: 814. 1891; C. Chr. Ind. 298, excl. syn.

Syn. *Aspidium Trianae* Mett. Ann. sc. nat. V. **2**: 243. 1864.
Nephrodium Trianae Bak. Syn. 286. 1867.
Nephrodium acutum Hook. sp. 4 tab. 271 (non descr. pag. 147). 1862.
Nephrodium firmifolium Bak. Syn. ed. II. 501. 1874.
Dryopteris firmifolia O. Ktze. Rev. Gen. Pl. **2**: 812. 1891; C. Chr. Ind. 266.

Type from Venezuela: Prov. de Barbacoas, via de Tiquerres, leg. Triana nr. 32 (B!).

Type of *N. firmifolium* Bak. from Peru: Mt. Guayapurima, leg. Spruce no. 4662 (Kew! also RB).

A comparison of the two original specimens (from Herb. Mett. and Herb. Hook.) of the two species adopted by Baker in Syn. Fil. shows at once, that they belong to the same species; as to texture, colour, cutting, shape of pinnules and most other important characters they agree perfectly; the only difference found is in pubescence, *D. Trianæ* having the secondary rachises very shortly puberulous by articulated hairs, while *D. firmifolia* is perfectly glabrous.

Rhizome not seen. Stipe about 50 cm long, fuscous, glossy, three-channelled above, with some few entire, narrow, lanceolate scales below, upwards without scales and hairs. Lamina broadly lanceolate, 60—70 cm long, about 40 cm broad below the middle, firmly chartaceous or subcoriaceous, pale-green beneath, totally glabrous, or, as in the type-specimen finely and shortly, deciduously (?) puberulous on the secondary rachises, tripinnatifid in the lower half, bipinnate at the middle. Pinnæ alternate, at distances of 8—10 cm, stalked, those of the 3rd or 4th pairs from below the largest, about 20 cm long; basal pinnæ broadest below the middle, narrowed towards both ends; upper pinnæ somewhat unequal at base, the lower side being the narrower. Pinnulæ at distances of 2—3 cm, the lower ones short-petiolate, the middle ones sessile, the upper decurrent, all acute at apex, cuneate at the posterior base truncate but not auricled at the anterior one, 3—5 cm long, 1—1½ cm broad, larger ones (those of the lower 3 or 4 pairs of pinnæ) lobed halfway down to the midrib, the lobes obliquely rounded, sometimes emarginate at the apex, the edges repand or broadly and shallowly crenate, towards the apex subacutely serrated. Pinnulæ of middle and upper pinnæ with repand or crenated edges. Veins

of larger lobes pinnate, not reaching the edge; lateral veins simple or furcate with a short soriferous branch that sometimes does not protrude beyond the sorus. Sori rather large, indusiate. Indusium subpeltate, rotundato-reniform, subpersistent, glabrous.

The description shows that *D. Trianæ* in several characters differs greatly from other species of § *Polystichopsis*, and it is with doubt I place it here. It is, in proportion to its size, less divided than any other species of the subgenus, and may be easily known by its not very deeply cut secondary pinnæ. In texture, colour it has some resemblance to *D. ochropteroides* and *D. macrostegia*, and its whole polystichoid habit and its apparently peltate indusium seem to indicate that its proper position must be here. An essential difference from all species of § *Polystichopsis* is, however, the shape of the lamina and the basal pinnæ, which are not deltoid but broadly lanceolate, broadest below the middle. In all species of § *Polystichopsis* the basal pinnæ are much the largest and their lower basal pinnula equally much larger than the following ones; in *D. Trianæ* lamina and basal pinnæ are narrower towards base. This character together with others, f. inst. venation, shape of lobes, points towards *Stigmatopteris* § *Peltochlaena*, and it is possible, that the species really is a member of that group, related to *D. subobliquata*.

358. **Dryopteris macrostegia** (Hook.) O. Ktze. Rev. Gen. Pl. **2**: 813. 1891; C. Chr. Ind. 276.

Syn. *Nephrodium macrostegium* Hook. sp. 4: 148. 1862; Bak. Fl. Bras. 1^2: 486; Jenm. W. Ind. and Guiana Ferns 226.

Type from Brazil, ad Rio Uaupés leg. SPRUCE nr. 2245 (Kew!).

Closely related to *D. ochropteroides*, agreeing with it in size, cutting, coriaceous texture, structure of scales of rhizome and stipe and large, subpersistent indusia, but it differs by its perfectly glabrous leaf, even the channels of the rachises above are destitute of hairs; lamina scarcely more than 4-pinnatifid, glossy above, ultimate segments obtuse. — It is not unlike some forms of *D. amplissima*, which species, however, always has paleaceous rachis. It so closely resembles *D. aristata* (Forst.) of the Old World, that one might be inclined to believe that it is a form of that widely distributed species; still *D. aristata* has fibrils on the ribs and mucronate teeth.

Brazil: Rio Negro, prope Panuré ad Rio Uaupés, SPRUCE nr. 2545 (B, H, L, RB, W). — Amazonas, Rio Içána, TH. KOCH nr. 66 (B). — Sine loco, GLAZIOU nr. 12377 (B, H, W).

BAKER (Fl. Bras. 486) also refers hereto a specimen from Br. Guiana, Roraima, APPUN nr. 959.

359. **Dryopteris amplissima** (Presl) O. Ktze. Rev. Gen. Pl. **2**: 812. 1891; C. Chr. Ind. 251.

Syn. *Polystichum amplissimum* Pr. Tent. 84. 1836 (nomen); Epim. 58. 1849. *Aspidium amplissimum* Mett. Aspid. 68 nr. 160. 1858.

Nephrodium amplissimum Hook. sp. 4: 145. 1860; Bak. Fl. Bras. 1²: 485; Syn. ed. II. 502.
Aspidium fallax Fisch. Ind. sem. ht. Petr. 1855; Linnæa 28: 357.
Acrophorus fallax Regel, Gartenflora 6: 343. 1857.
Aspidium ramosum Fée, Cr. vasc. Brésil 1: 141 tab. 47 fig. 3. 1869.
Aspidium latissimum Fée, l. c. 142 tab. 48 fig. 2.
Aspidium consobrinum Fée, l. c. 140 (non 11. mém. 85).
Type from South Brazil, leg. Beyrich and Sellow (cotype in B!).

Rhizome shortly creeping, 1—2 cm thick, densely coated with clathrate, dark-brown or reddish-brown, glossy, narrow, lanceolate-acuminate scales that are sharply toothed, often with claw-shaped teeth. Stipites rather close, strong, fuscous or castaneous, strong, up to 50 cm long, towards the base densely, upwards more sparsely paleaceous with similar scales. Lamina deltoid-ovate, probably up to one meter high and nearly as wide at base, coriaceous, brownish when dried, the rachises and midribs glanduloso-pubescent above, sometimes with some yellowish cylindrical glands beneath, otherwise without hairs, but rachises I—IV beneath with several, often many near the axils, rather deciduous, lanceolate, toothed, red-brown scales, 4-pinnate—5-pinnatifid. Pinnæ and pinnules ovate-oblong, somewhat unequal-sided, the anterior side wider than the posterior one, most so at base; lower side of basal pinnæ produced; rachises II—III not winged. Quaternary pinnules or segments of middle pinnæ oblong, obtuse, rarely 5 mm broad, more or less deeply lobed with 3—4 falcate, obtuse or subfalcate lobes on each side; each ultimate lobe (of V. order) bears a sorus. Indusia dark-brown, subpersistent, glabrous, subreniform or almost subpeltate. Sporangia glabrous; spores minutely and densely papillose.

A pretty, large species, connecting *D. effusa* and its allies, especially *D. macrostegia*, with *D. denticulata*, in habit and cutting approaching the former, in indusia and spores the latter species, different from both by its toothed scales and scaly rachises. I have described above what I consider the typical form. It is fairly constant, mainly varying in degree of cutting. *A. latissimum* and *A. consobrinum* Fée are quite the same, while *A. ramosum* somewhat approaches the var. *phaeochlamys*. The leaves are a little dimorphous, the sterile ones having broader segments than the fertile ones, a feature also observed in *D. ochropteroides* and *D. macrostegia*.

D. amplissima is evidently common in South Brazil; I enumerate some of the numerous specimens, which I refer to the typical form.

Brazil. Rio Janeiro: Sellow nr. 5828 (B); Glaziou nr. 979 (H = *A. consobrinum* Fée, also nr. 2350, not seen), 2389 and 2394 (H, RB, Rg = *A. latissimum* Fée), 2391 (H = *A. ramosum* Fée), 5276 (B, H, Rg), 7268 (B, H); Burchell nr. 2460 (B); Jelinek nr. 167 (B, RB; Mendonça nr. 852, 1385 (B); Theresopolis, H. Schenck nr. 2927 (RB). — São Paulo: Oajurú, Regnell nr. III. 1454 (U, W); Santos, Mosén nr. 3544 (Rg, S); Campinas, Heiner nr. 617 (Rg; Jaraguá, C. Brade nr. 5252 (R); 1) near Itapecirica, 2) between Apiahy and Yporanga, 3) near Parnahyba ad fl. Tieté, Wettstein

et Schiffnér (RB); Rio Grande, Wacket nr. 43 (R). — Santa Catharina: Joinville, Otto Müller nr. 146 (R); sine loco, Ule nr. 191 (RB). — Paraná: Roça Nova, Dusén nr. 2226 a (Rg), Serro do Mar, Ypiranga, Dusén nr. 6669 (Rg), Porto de Cuna, Dusén nr. 10247 (Rg); Villa Nova, J. Annies ed. Rosenst. Fil. austr. bras. exs. nr. 74 (B, R, Rg, RB, W). — Rio Grande do Sul: Serro do Acre, Jürgens nr. 155 (R).

Paraguay: prope Sapucay, Paraguaria centralis, Hassler nr. 12214 (R).

Bolivia: Polo Polo bei Coroico, Nordyungas, Buchtien nr. 3377 (R, RB).

var. **phaeochlamys** (Fée).

Syn. *Aspidium phaeochlamys* Fée, Cr. vasc. Brésil **1**: 140 tab. 47 fig. 2 and the 3rd figure above from the left ("fig. 1" ex errore). 1869.

Aspidium biforme Fée, l. c. 139.

Aspidium macrum Fée, l. c. 141 tab. 48 fig. 1.

A less cut form, 3-pinnate—4-pinnatifid with the sori on segments of IV. order. Rachis of secondary pinnules nearly winged to the base; tertiary pinnules deeply lobed towards the base only, their upper half toothed or subentire, often more than 1 cm broad. — Seems to be a form from drier regions.

Brazil: Rio Janeiro: Glaziou nr. 1782 (H, Rg, W = *A. phaeochlamys* Fée), 2390 (H, Rg = *A. macrum* Fée), 2393 (H, Rg = *A. biforme* Fée). — Minas Geraes: Glaziou nr. 14449 (B); Caldas, Mosén nr. 2141 (B, CC, H, L, Rg): T. de Moura nr. 36 (B); Serra da Saphyra, H. Magalhaes nr. 2336 (RB); near Ouro Preto, Schwacke nr. 12435 (RB); Serra do Cubatão, Schwacke nr. 14181 ("Epiphyte"). — São Paulo: Campinas, Mosén nr. 3940 (Rg). — Matto Grosso: H. Smith nr. 79 (RB).

Paraguay: Cordillère de Péritébui, Balansa nr. 2905 (B, CC, H); pr. Tobati, Hassler, Pl. Paraguar. nr. 4003 (B); Sierra de Amambay, Rojas ed. Hassler nr. 10170 (R, RB).

var. **subeffusa** n. var.

Nephrodium amplissimum Jenm. W. Ind. and Guiana Ferns 226.

Very large, "5 ft. high"; basal pinnæ about 75 cm long on stalks 8 cm long and with pinnæ of II. order at distances of 6—7 cm, the habit, therefore, very open. Secondary pinnæ about 15 cm long with their rachises winged nearly to the base, midribs of tertiary ones winged to base, all quaternary segments decurrent with 3—4 subacute teeth on each side. — By its winged rachises it has much resemblance to *D. effusa*, but in all other characters it agrees with *D. amplissima*.

British Guiana: Roraima, im Thurn nr. 354 (W); R. Schomburgk nr. 1151 (RB).

360. **Dryopteris denticulata** (Sw.) O. Ktze. Rev. Gen. Pl. **2**: 812. 1891. — Fig. 25.

Syn. *Polypodium denticulatum* Sw. Prodr. Fl. Ind. occ. 134. 1788; Fl. Ind. occ. **3**: 1692.

Aspidium denticulatum Sw. Schrad. Journ. **1800**^{2}: 40. 1801; Syn. 57; Mett. Aspid. 68.

Polystichum denticulatum J. Sm. 1841; C. Chr. Ind. 580, with synonymy.
Nephrodium denticulatum Fée 1850—52; Hook. et Bak. Syn. 287; Jenman, Bull. Dept. Jamaica n. s. **3**: 111. 1896; W. Ind. and Guyana Ferns 225. (For other synonyms see below).
Type from Jamaica, leg. SWARTZ (S! H.).

The present well-known species has in recent years commonly been referred to *Polystichum* because of its indusia sometimes being subpeltate; they are, however, as a rule reniform, although the sinus can be very low, sometimes scarcely visible, and the whole structure of the plant is considerably different from all *Polysticha*. With the three next species it forms a specialized little group, marked by the much divided, mostly deltoid lamina with small ultimate segments.

D. denticulata in a wider sense is a very polymorphous species of a wide distribution in tropical America. Some of the forms are confined to restricted areas, and one would be inclined to consider such good species, but my examination of a very comprehensive material has shown that even those forms that are most remote from the Jamaican type, are connected with it and with each other by numerous intermediate forms; thus the small Mexican form, *Aspid. jucundum* Fée, is on the one side, through larger forms occurring in Central America and northern South America, connected with the typical form, and, on the other side, closely resembles the Brazilian *A. gracilipes* Fée, which again can scarcely be distinguished from *A. lætum* Sw., a form extremely different from the Jamaican type. I have, therefore, found it most natural to refer all these different forms to one single species: *D. denticulata*. In the following treatment I group all the forms known to me under three headings based on their geographical distribution, and I confine myself to give special names to the more distinct forms only.

A. West-Indian Forms.

1. f. **genuina**. — Fig. 25 a. — Rhizome erect or decumbent, sometimes shortly creeping, stout, at the apex with a dense tuft of glossy, castaneous, lanceolate-acuminate, entire, rather thick scales, which are 2—3 cm long, 1—2 mm broad. Stipe up to 50 cm long, below castaneous and clothed with similar scales, upwards fusco-stramineous, above sulcate. Lamina deltoid, 20—40 cm long and broad, glabrous or sometimes with some few minute, hairlike fibrils on the rachises, membranous or coriaceous, pale green beneath, 4—5- or even 6-pinnate. Pinnæ and pinnules close, the basal pinnæ with the basiscopic side much produced. Secondary rachises often flexuose. Ultimate segments obovate or oblanceolate, 5—8 mm long, 3—4 mm broad, cuneate at the base, the margins more or less deeply lobed and the outer edge with 1—3 aristate or spinulose teeth. Veins pinnate in the ultimate lobes, running to the teeth. Sori near the tip of the veins, 2—4 to a lobe, covered by a subpersistent,

reddish-brown, flat, glabrous indusium, which is about 2—3 mm broad, reniform with the sinus generally distinct. Sporangia with a long, slender pedicel, glabrous. Spores with a broad, very finely and densely papillose, irrigularly crested episporium.

The here described typical form is apparently confined to Jamaica, where according to JENMAN (W. Ind. and Guiana F. 225) it is only found in high elevations (5000—7000).

Fig. 25. Tertiary pinnulæ of varieties of *D. denticulata* (Sw.) O. Ktze., nat. size. *a.* f. *genuina*, *b.* var. *barbensis*, *c.* var. *dissecta*, d. f. 6 (MORITZ n. 264).

Jamaica: EGGERS nr. 3644 (B, RB, W); MAXON nr. 1230 (RB, W = UNDERWOOD nr. 2352), 1353 (W), 1424 (W = UNDERWOOD nr. 2543), 2632 (CC, Rg, W), 2735 (W), UNDERWOOD nr. 543 (B, W); HART nr. 24 (W); CLUTE nr. 178 (W); DAY nr. 278 (B); M. D. WATT nr. 207 (R, RB); W. HARRIS nr. 7122 (H, W); O. HANSEN nr. 27 (B).

HOOKER's and JENMAN's variety *rigidissima* from Jamaica I have described below as a valid species, although it is possible that further material will prove it to be a form of *D. denticulata* growing in exposed situation.

f. 2. A form with a more open and less rigid lamina, the ultimate segments more oblong and the sori much smaller than in f. *genuina*; in habit more resembling some of the continental forms.

Haïti prope Furcy, 1500 m.; PICARDA nr. 232 (B).

B. Andine Forms.

f. **3. jucunda** (Fée). — Syn. *Aspidium jucundum* Fée, 10. mém. 41. 1865 (excl. t. 42 f. 1).

Dryopteris formosa Maxon, Contr. U. S. Nat. Herb. **13**: 17. 1909.

In its typical form that occurs in southern Mexico to Costa Rica this differs mainly from f. *genuina* by its smaller size: lamina 20—30 cm long and broad, 3-pinnate—4-pinnatifid, seldom 4-pinnate; texture thinner, colour often fresh green, and the scales of the rhizome smaller and fewer. Ultimate segments variable in shape, from ovate to oblong, their teeth spinulose. Indusium small, deciduous, its sinus often very low.

The specimens from Costa Rica—Panama—Colombia are often considerably larger, rivalizing the typical form in size, but otherwise they do not differ from the true *jucunda*. From f. *genuina* they differ, as a rule, by their more open lamina with more oblong ultimate segments.

Maxon has named this form *D. formosa* (Fée), believing it to be Fée's *Aspidium formosum* and separable from *D. denticulata*; now he agrees with me that this is not the case and that the name *formosa* properly must be applied to that Cuban species previously known as *D. cubensis* (Mett.) O. Ktze., under which the question is discussed. The original *D. jucundum* Fée is Mexican (Galeotti nr. 6563, not seen).

Mexico: Vera Cruz, S. Christobal, Bourgeau nr. 3189 (H); Cordova, H. Fink nr. 33 a (W), Serra Madre, C. A. Purpus nr. 6061 (W). — Chiapas, Urwald des Zontehuitz, Munch nr. 109 (RB).

Guatemala: Dept. Alta Verapaz, Coban, v. Türckheim nr. II. 1854 (H, CC, W), 3819 (W); Tactic, v. Türckheim nr. 183 (RB, W). — Dept. Baja Verapaz, inter Purulhá et Panzal, v. Türckheim nr. II. 1678 (W). — Dept. Quiché, San Miguel Uspantán, Heyde et Lux ed. J. D. S. nr. 3242 (W).

Costa Rica: Volcan de Poas, Pittier nr. 330 bis (RB), 16450 (RB). Alfaro nr. 114 (W), Tonduz nr. 10698 (RB, W). — Tablazo, Biolley nr. 75 (W). C. Brade nr. 25 (R, W) = A. et C. Brade ed. Rosenstock Fil. exsic. costaric. nr. 42 (B, RB), Lehmann nr. 1784 (B, W). — Cartago, Maxon nr. 515 (W). — Estrella, J. J. Cooper ed J. D. S. nr. 6032 (B, W). — Sine loco, Pittier nr. 827 bis (RB), Wercklé (CC, R, RB, W).

Panama: Chiriqui, Maxon nr. 5403, 5404 (CC, W).

Colombia: Tolima, Stübel nr. 48 (B). — Canoas, Lindig nr. 98 (B). — Antioquia, Caramansa, Lehmann nr. 3236 (B).

Venezuela: Merida, Funck et Schlim nr. 1572 (B).

f. **4.** var. **barbensis** nov. var. — Fig. 25 b. — Large, about as f. *genuina*, 5- or even 6-pinnate; ultimate segments small, oblanceolate, scarcely 5 mm long, 2—3 mm broad, very close. Texture herbaceous, slack. Sori one to each segment, small, indusium vaulted, deciduous. — In habit not unlike *D. formosa*, but the scales and teeth are like those of f. *jucunda*.

Costa Rica: Volcan de Barba, C. Hoffmann nr. 79 (B), Pittier nr. 1932 (B, RB, W).

f. **5. boliviensis**. Very large; lamina about 50 cm long and broad, basal pinnæ 25 cm long, firm, greyish green, fully 6-pinnate; ultimate segments close, oblanceolate, 5—8 mm long, 2—4 mm broad, their teeth subspinulose. Sori 1—2 to each segment with persistent, reddish, reniform or subpeltate indusia.

Bolivia ad Rio Tocoraui, Herzog nr. II. 2295 (R).

f. **6.** — Fig. 25 d. — Here I group together a series of specimens, which differ from the forms already described by the acute (not spinulose teeth of the ultimate segments. The lamina is of different size, often as large as f. *genuina*, but more open and not so broadly deltoid, generally ovate or ovate-lanceolate, generally much divided (5—6-pinnate). Some of the specimens may be old stages of f. *jucunda*, others seem rather different, f. inst. some small plants with lamina sometimes under 10 cm long; these small plants are all from high elevations and have more scaly rachises than any other form of the species. A similar form from Roraima Jenman (W. Ind. and Guiana F. 225) has called subsp. *Klotzschii*, but it cannot be consociated with *A. Klotzschii* Hook. It is probable that the specimens listed below represent several varieties but my material is too scanty to settle the question.

Colombia: Popayan, Lehmann nr. 4415 (B, RB). — Paramos de San Pedro, Ocaña, Schlim nr. 317 (B; small).

Ecuador: Andes of Loja, Lan Lucas, 9000′, Lehmann (RB).

Venezuela: Tovar, Moritz nr. 264 B, RB, U); Fendler nr. 170 (B; small); Wagener (B). — Merida, Funck et Schlim nr. 1584 (RB).

British Guiana: Roraima, R. Schomburgk nr. 39 (RB, 1152 (B); Im Thurn nr. 26, 169 (W), 225 (W, small).

f. **7.** var. **dissecta** (Fée). — Fig. 25 c. — Syn. *Aspidium dissectum* Fée, 8. mém. 107. 1857.

A finely dissected, 6-pinnatifid form with the ultimate segments scarcely 2 mm broad, oblanceolate, subacute or even obtuse, unisorous. Lamina 30 cm long, coriaceous. — Both Hooker (sp. 4: 148) and Mettenius (Prodr. Fl. N. Gr. 244) referred this variety to the var. *rigidissimum*, from which, my *D. rigidissima*, it differs considerably by the shape of the ultimate segments; to my mind it is intimately allied to some of the forms grouped together under f. 6.

Colombia: Paramos de San Pedro, Ocaña, 10—11000′, Schlim nr. 323 (B).

f. **8.** var. **aperta** var. nov. — Fig. 26. — A peculiar looking variety or, perhaps, a new species, differing from all other forms by its very open lamina with the pinnæ at distances of 7 cm, divaricating, not touching each other; lamina 30—35 cm long, rather herbaceous, 4—5-pinnate; ultimate segments long-cuneate,

about 1 cm long, 5 mm broad, more or less lobed or toothed, the lobes acute, not spinulose. Sori rather few; indusium subreniform, dark-brown.

British Guiana: Summit of Roraima, 8600′, F. V. Mc. Connell and J. J. Quelch nr. 622 (B).

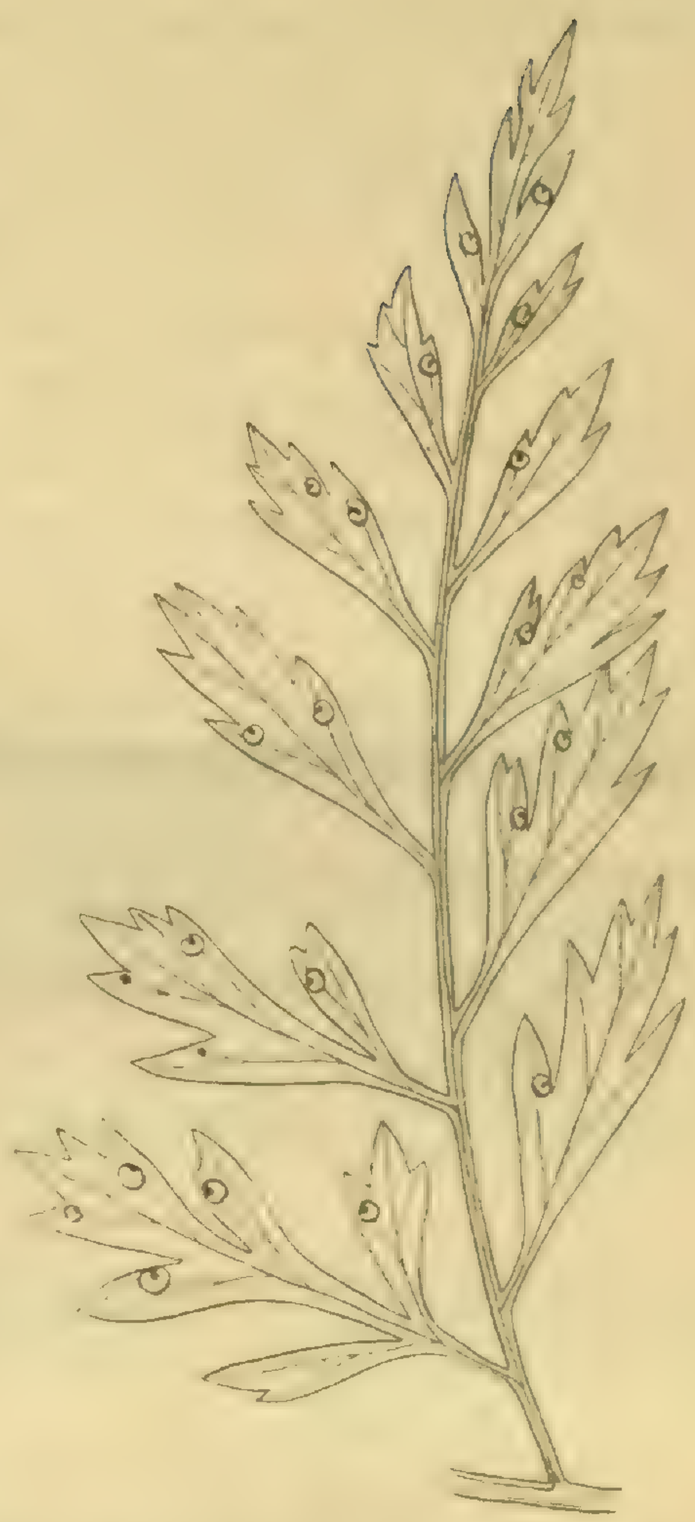

Fig. 26. Secondary pinnula of *D. denticulata* var. *aperta*, nat. size.

C. South-Brazilian Forms.

Subspecies: 360 b. **Dryopteris laeta** (Sw.) C. Chr. (not Ind. 273).

Syn. *Aspidium laetum* Sw. Vet. Akad. Handl. 1817: 63 t. 4 f. 3! Mett. Aspid. 67.
Aspidium Klotzschii Hook. Ic. pl. t. 923!
Polystichum tenerum Fée, Gen. 280. 1850—52 (ex descr.).
Aspidium tenerum Fée, Cr. vasc. Br. 1: 147. 1869.

Rhizome oblique with a fair number of dark-brown, narrow, weak, often crisped scales. Stipes fasciculated, often 10—15, castaneous, 6—10 cm long. Lamina ovate or ovate-oblong, seldom subdeltoid, 10—15 cm long, 8—12 cm broad, subcoriaceous, 3-pinnate, 4-pinnatifid. Ultimate segments ovate, shortly cuneate on the posterior side, the margins more or less deeply lobed, the apex rounded with 3—4 triangular, acute teeth. Indusia brown, reniform, subpersistent. Spores papillose.

The typical *laeta*, excellently figured by Swartz and Hooker (loc. cit.) is apparently not very closely allied to *D. denticulata* and it might be very natural to deal with it as a valid species. Still it is impossible to draw a definite line between it and the following f. *gracilipes*; in some specimens some leaves are typical *laeta*, others *gracilipes* and this is sometimes difficult to distinguish from some of the smaller Andine forms. The larger *gracilipes* is a form of the humid forests of the coast sierras, the smaller, more rigid *laeta* a reduced form from the drier plateaus of Minas Geraes.

Minas Geraes, Freyreis (S), Sellow (B), Martius (B, Riedel nr. 77 (B, H, Rg), Glaziou nr. 12377 (B), L. Damazio nr. 493 (RB), Schwacke nr. 9476 (RB).

f. **gracilipes** (Fée). — Syn. *Aspidium gracilipes* Fée, Cr. vasc. Br. 1: 146 t. 49 f. 2. 1869!

Differs mainly from typical *laeta* by its longer stipe, larger, less rigid and generally deltoid lamina, 15—25 cm long and broad, and by its commonly longer (but scarcely aristate) teeth of the segments.

Rio Janeiro, Glaziou nr. 2053, 2382, 2462 (H), 4436, 5268 (B, H), 5269 (B, H, BR, Rg), 5270 (B, H). — Minas Geraes: Itacolumi, A. Silveira nr. 1449 (RB); Serra de Ibitipoca, Schwacke nr. 12334 (RB), Moura nr. 57 (B). — San Paulo: Serra do Mar, Wacket ed. Ros. Fil. exs. austrobras. nr. 429 (R, RB, W). — Sta. Catharina: Desterro, E. M. Reineck (RB).

NB. *Polypodium ligustifolium* Poir. Enc. 5: 553, in Ind. Fil. referred to *D. denticulata*, is *ex descriptione* and according to a specimen in RB from Herb. Desvaux a form of *Polystichum adiantiforme* (Forst.) J. Sm. *Aspidium frondosum* Wikstr. also referred to *D. denticulata* (Ind. Fil. 74) is *D. meridionalis* (Poir.) C. Chr.

361. **Dryopteris rigidissima** (Hook.) C. Chr. sp. nov. — Fig. 27.

Syn. *Nephrodium denticulatum* var. *rigidissimum* Hook. sp. fil. 4: 148. 1860 (excl. loc. New Granada); Jenman, Bull. Dept. Jam. n. s. 3: 111. 1896.

Type from Jamaica [leg. Wilson and Purdie (not seen)], Maxon nr. 1403.

Rhizome, scales and general structure of the lamina not different from *D. denticulata*, to which species it should perhaps be referred as a variety, but the whole aspect of the plant is very different from all forms of that species, and I have never met with intermediate forms. — Lamina ovate or ovate-deltoid, 20 cm long 15—20 cm broad, coriaceous, glabrous, finely dissected, 5-pinnate. Pinnæ and pinnulæ close; basiscopic pinnulæ of the basal pinnæ less produced than in *D. denticulata* f. *genuina*. Ultimate segments cuneate-lanceolate, 4—6 mm long, not more than 1—1½ mm broad, mucronate not spinulose), entire or cleft, each with a simple or furcate vein and a single, small sorus. Indusium rather deciduous, reniform, scarcely more than 1 mm broad.

From the very similar *D. denticulata* var. *dissecta*, referred by Hooker hereto, it differs by its compact habit and mucronate teeth.

Fig. 27. *D. rigidissima* (Hook.) C. Chr. Small pinna from the upperside, nat. size.

Jamaica: Summit of Blue Mountain Peak, on very steep moist wooded slope, Maxon nr. 1403 (W, CC, H, Rg); O. Hansen (CC). Sto. Domingo: Prov. de la Vega, in Loma Bosilla, 2500 m, Fuertes nr. 1782 (B).

362. **Dryopteris leucostegioides** n. sp. — Fig. 28.

Syn. *Polystichum denticulatum* var. *rigidissima* Hieron. Engl. Jahrb. 34: 453. 1905.

Type from Colombia, Bogotá, Lindig nr. 234 (B!).

Rhizomate crasso, erecto, squamis rufis, mollibus, lanceolatis vel ovato-lanceolatis, marginibus pilis capitatis glanduliferis (sessilibus vel pedicellatis) dense vestito. Stipitibus fasciculatis, 8—12 cm longis, brunneo-stramineis. Lamina coriacea vel membranacea, ovata vel ovato-lanceolata, 10—15 cm longa, 8 cm lata, 4-pinnatifida. Rachibus paleis filiformibus deciduis paucis præditis. Pinnis pinnulisque densis, ultimis (IV ordinis) obovatis, 3—4 mm longis, 1—2 mm latis, obtusis vel subacutis, integris vel obtuse dentatis, interdum sublobatis. Venis indivisis furcatis vel subpinnatis. Soro singulo pro segmento; indusio subpersistente, reniformi; sporis breviter verruculosis.

A critical species, perhaps a high-andine variety of *D. denticulata*; still it differs from all forms of that species by its soft, rufous, glandulose scales and its obtuse segments. As to these characters it resembles the following species, which, however, is a much larger species of a thinner texture, without fibrils on the rachises and with smooth spores.

Colombia: Bogotá, LINDIG nr. 234 (B). — Cundinamarca, Facatativa, LEHMANN nr. 2458 (B).

Panama: près de David, J. HÉLION (RB).

Fig. 28. *D. leucostegioides* C. Chr. **Second pinna from below, nat. size, and pinnula × 2.**

363. **Dryopteris formosa** (Fée) Maxon in litt. (not Contr. U. S. Nat. Herb. **13**: 17. 1909).

Syn. *Aspidium formosum* Fée, Gen. 296. 1850—52 (excl. loc. Mexico).
Aspidium jucundum Fée, 10. mém. t. 42 fig. 1. 1865 (non descr. p. 41).
Aspidium cubense Kuhn, Linnaea **36**: 108. 1869.
Nephrodium cubense Bak. Syn. Fil. ed. II. 501. 1874.
Dryopteris cubensis O. Ktze. Rev. Gen. Pl. **2**: 812. 1891; C. Chr. Ind. 260.
Type from Cuba, leg. LINDEN nr. 2115! (RB).

A large species allied to *D. denticulata*, in habit and much divided lamina closely resembling some forms of that species especially var. *barbensis*, but well marked by some essential characters: 1) the scales of the rhizome are yellowish or reddish brown, opaque, thin and soft, ovate-lanceolate or lanceolate, not glandulose, 2) the ultimate segments are lanceolate with obtuse teeth or lobes, and 3) the spores are smooth, not papillose.

Rhizome short, erect, scaly. Lamina ovate or ovate-deltoid in the largest specimen seen 40 cm long on a stalk 45 cm long, but as a rule smaller, firmly herbaceous, rather flaccid, perfectly glabrous, 4-pinnate—5-pinnatifid. Basal pinnæ 25 cm long with the lower side somewhat produced. Sori at maturity nearly filling the whole segment; indusia dark-brown, reniform, subpersistent.

Cuba: Santiago, Pinal de Nimanima, LINDEN nr. 2115 (RB). — Oriente, WRIGHT nr. 1099 (B, Kew, RB, S, W).

My choice of the specific name *formosa* for this species instead of *cubensis* claims an explanation. I have asked Mr. MAXON to give me his opinion on the matter, and I agree with him in his conclusion. Under the original description of *A. formosum* FÉE quoted three collector-numbers: LINDEN 2115 (Cuba), LINDEN (should be GALEOTTI) 6563 et 6473 (Mexico). Under the description of *A. jucundum* he quotes: Mexico: GALEOTTI 6563, Cuba, LINDEN 2115, thus by elimination the name *formosa* should be applied to GALEOTTI 6473, which has been done previously by MAXON (Contr. U. S. Nat. Herb. **13:** 17). But it is certain that FÉE's description of *A. formosum* agrees with LINDEN 2115 from Cuba only, not with any Mexican form seen by me, and his remarks under *A. jucundum* and also in Cr. vasc. Br. **1**: 147 show clearly that he distinguished his two proposed species thus: *A. jucundum*: Les derniers segments aristés, *A. formosum*: Les derniers segments absolument mutiques; écailles jaunâtres, rubanées, which differences are clearly described in the two descriptions. According to this *A. jucundum* is no doubt that smaller form of *D. denticulata* described above as f. *jucunda,* and *A. formosum,* based on LINDEN 2115, according to authentical specimens is identical with *A. cubense* Kuhn (WRIGHT 1099). But the matter is still more complicated; FÉE also quotes LINDEN 2115 under *A. jucundum* and illustrates this species on pl. 42 fig. 1. This figure, although not very good, beyond doubt represents the Cuban form and is probably drawn after LINDEN 2115; if *A. jucundum* were to be interpreted upon the basis of FÉE's figure, the name should be preferred for the Cuban species. Still it is evident that FÉE has committed a double error in quoting LINDEN 2115 under *A. jucundum* and in using a Cuban specimen for the illustration of *A. jucundum.* I believe, therefore, that Mr. MAXON is right in interpreting the two proposed species of FÉE on the basis of the descriptions, not of the figure, and consequently the Cuban species must bear the name *D. formosa* (Fée) Maxon.

Species of Uncertain Relationship.

364. **Dryopteris fuliginosa** n. sp. — Fig. 29.

Type from Venezuela ("Caracas"), leg. BREDEMEYER (CC).

Species memorabilis nullis comparanda, rhizomate ignoto; stipite incompleto $^1/_2$ cm crasso, superne bisulcato, rufo brunneo ut rachi paleis duris crassis, atrobrunneis ovatis vel spathulatis (basi eorum crassiore, angustiore 3—4 mm longis, 2—3 mm latis, integris, appressis, punctis elevatis affixis subdense onusto, paleis deciduis muricato. Lamina ovata, c. 50 cm longa, 35 cm lata, rigide coriacea, in sicco intense brunnea, pilis omnino destituta, ad costas costulasque subtus ut rachi paleacea, paleis minoribus, ovatis spathulatis vel fere linearibus, tripinnatifida. Pinnis alternis, approximatis, sessilibus, basi superiore rachin superne tegentibus, oblongolinearibus, acuminatis, ad 20 cm longis, 4—5 cm latis, superioribus sensim minoribus,

basalibus latere basiscopico aucto inaequalibus vix longioribus, pinnatis. Pinnulis sessilibus vel potius late adnatis ala angusta connectis, basi subbiauriculatis (auriculis brevibus rotundatis, anteriore costam pinnae tegente) obtusis, oblongis, 2—3 cm longis, vix 1 cm latis, basalibus aequalibus, marginibus pinnatifidis vel lobatis, segments sive lobis rotundatis vel suboblongis, basalibus latioribus; pinnulis basiscopicis pinnarum basalium parum auctis, 5—6 cm longis, $1^1/_2$ cm latis, basali ceteris aequali vel paullo breviore. Costis costulisque superne subplanis glaberrinus, inferne teretibus paleaceis (ut supra descriptum est). Venis nigricantibus, subtus prominulis, in lobis pinnatis vel furcatis. Soris per totam laminam aspersis, uno pro lobo, costulae approximato, vel 2—4 in segmentis majoribus pinnarum inferiorum, globosis, superficialibus, indusiatis. Indusiis peltatis, coriaceis, brunneis, glabris; sporangiis nitidis, paraphysibus articulatis, apice glandulosis intermixtis. Sporis ovalibus vel subreniformibus, lævibus vel levissime verrucosis.

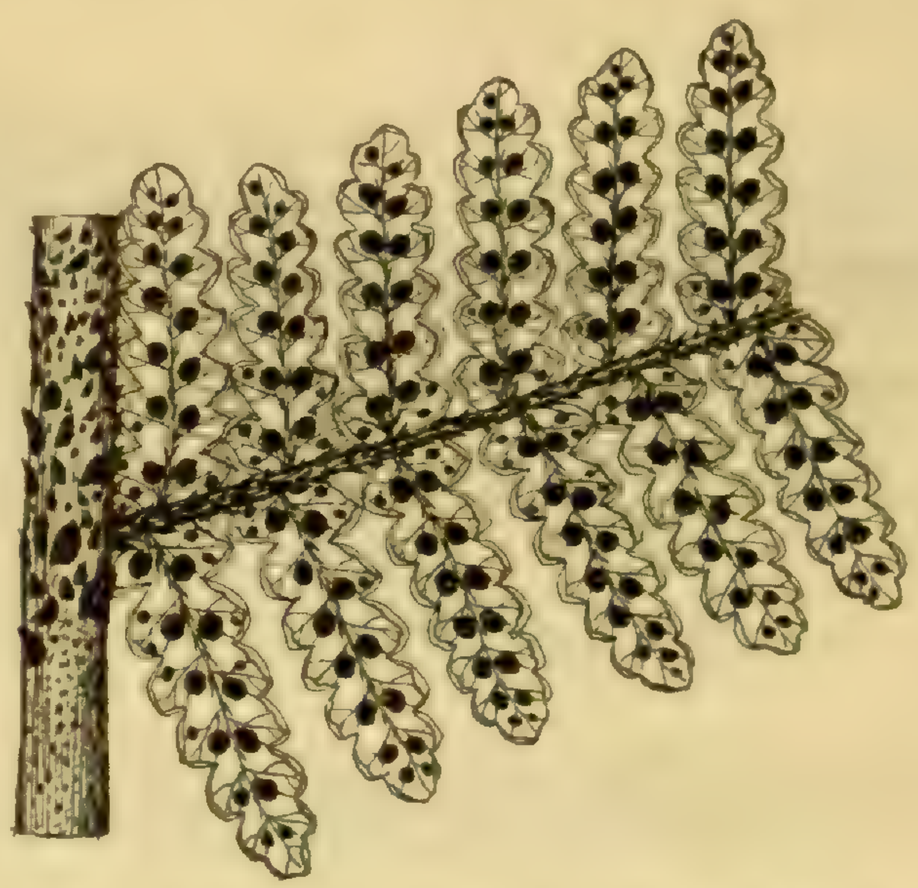

Fig. 29. Basal part of the second pinna from below of *D. fuliginosa* C. Chr. nat. size.

This remarkable fern, which I have had in my collection for several years, originally distributed from "Herb. Mus. Palat. Vindob.", is so different from all other American species of *Dryopteris* known to me, that I must confess that I do not know, in which group I am to place it. In spite of its peltate indusia it is certainly not a species of *Polystichum,* its whole habit being entirely dryopteroid. Probably it has its nearest relatives among the species of *Ctenitis,* although it differs greatly in several characters. In habit it resembles some species of the *hirta*-group and also some of the *subincisa*-group; from all it differs in its very coriaceous texture, peltate indusia, the perfect absence of hairs even on the costæ above, in its spores and in its very peculiar scales. These are rather small, thick, those of the stipe and rachis closely appressed (as in some forms of the *ampla*-group), those of the costæ and costules smaller and not so appressed, ovate or spathulate, becoming narrower towards their thick base which is fixed to an elevation on the rachis; when the scales fall the stipe and rachis become muricate. In the entire absence of hairs the species recalls *Eudryopteris,* from which it is considerably different, f. inst. in the not decurrent secondary ribs and by the whole lamina being fertile; scarcely one sterile segment or lobe is to be found.

Appendix.

While I have been reading the proofs Prof. Rosenstock has kindly sent me some pinnæ of three species recently described by him, viz.

Dryopteris Tamandarei Ros. Hedwigia **56**: 365. 1915. — S. Brazil: São Paulo, l. Tamandaré et A. C. Brade no. 6534. A very critical form, much resembling large forms of *D. rivularioides*, but very sparsely pubescent and the sori ex-indusiate.

Dryopteris janeirensis Ros. l. c. 367. — Brazil: Rio de Janeiro, Serra do Itatiaya, l. Tamandaré et Brade no. 6462. — This is no doubt quite distinct from all other S. Brazilian species of § *Lastrea*, but it comes very near to *D. rudis* or to the more glabrous *D. nervosa*. I have seen specimens of this species before, f. inst. Glaziou no. 5263 (H), but my material being too incomplete I have not described it.

Dryopteris laetevirens Ros. l. c. 368. — Brazil: S. Catharina, Lüderwaldt no. 1380. — This can with approximative certainty be referred to *D. submarginalis* as a less scaly form.

Species Inquirendæ.

Below I enumerate in an alphabetical list the American »species« of *Dryopteris*, which I know from descriptions only and which I have not with certainty succeeded interpreting. The list is scarcely complete. Most of them were mentioned under species dealt with by me or at the end of the different subgenera; for these I refer to my earlier papers. (I = Monograph, part I). After those, not mentioned there, I add the type-locality and collector with my suggestions as to their possible identity. *Nomina nuda* I have omitted.

Aspidium *albicaule* **Fée. — Mexico. — I. 195.**

A. ameristonevron **Fée. — »Cuba«. — supra p. 44.**

A. brachynevron Fée, Cr. vasc. Brés. **1**: 133. 1869 — Bahia. — Probably a *Stigmatopteris* (*S. Carrii?*).

A. cheiloplotium Fée; *Dryopteris cheiloplotia* C. Chr. Ind. — Mexico. — I. 272.

A. chontalense Fourn. Bull. Soc. Fr. **19**: 254. 1872; *Dryopteris chontalensis* C. Chr. Ind. 257. — Nicaragua: Chontales, P. Lévy nr. 516. — I have not succeeded in identifying this species with any of those known to me; it is possibly *D. Hemsleyana* or, perhaps, my *D. chiriquiana.*

A. coadunatum Klf. — Brazil. — I. 246.

A. confluens Fée. — »South America«. — I. 156.

A. consobrinum Bory; Fée. — Guadeloupe. — v. supra p. 46.

A. conspersoides Fée. — Mexico. — I. 195.

A. emarginatum Willd. sp. **5**: 235. 1810. — Sto. Domingo, based on Plumier pl. 62 A. — Baker, Syn. Fil. 262 says that it is not improbably *D. subobliquata*, but certainly it is not that species; the figure recalls rather some species of *Asplenium.*

A. eriosorum Fée, Cr. vasc. Brés. **2**: 73 t. 101, 1873. — Brazil, Glaziou no. 5264, 5265. — In my first paper p. 303 referred with doubt to *D. scariosa.*

A. Fischeri Mett. — Brazil. — I. 156.

A. Germani L'Herm.; Fée. — Guadeloupe. — I. 180.

A. guianense Kl. — Guiana. — I. 81.

A. hemiotis Christ, Hedwigia **45**: 191. 1906. — Amazonas, Huber. — A form of *Goniopteris*, imperfectly described.

A. Huberi Christ. — Amazonas. — I. 73. — Said to be allied to *D. patula.*

A. inquinans Fée. — Mexico. — I. 70, under *D. indecora.*

A. Linkii A. Br. Ind. sem. ht. Berol. 1856; conf. Mett. Aspid n. 185 b. — A cultivated form of *Lastrea.*

A. lutescens Willd. sp. **5**: 272. 1810. = *Polypodium pulverulentum* Poir., see below.

A. microcarpon Fée. — Mexico. — I. 97.

A. microchlæna Fée. — Mexico. — I. 97.

A. nervatum Fée. — Brazil. — I. 112.
A. nitidulum Kze. — Brazil. — I. 246.
A. obtusilobum Fée. — Mexico. — I. 112.
A. Orizabæ Fée. — Mexico. — I. 195.
A. pachychlamys Fée. — Guadeloupe. — I. 156.
A. pallidum Fourn. — Mexico. — I. 195.
A. pauper Fée. — Martinique. — I. 195.
A. producens Fée. 10. mém. 38. 1865. — Mexico, Tolutla, SCHAFFNER no. 220 part. — Perhaps a form of *D. panamensis*, scarcely of *D. diplazioides*, to which Fourn. Mex. pl. 73 referred it.
A. prominulum Christ. — Costa Rica. — I. 191.
A. roseum Fourn. — Mexico. — I. 71.
A. sanctoides Fée. — Guadeloupe. — I. 156.
A. setigerum Sw. — Sto. Domingo. — supra p. 41.
A. tenuiculum Fée. — Cuba? — I. 272.
A. Tussaci Feé, Gen. 297. 1852. — Sto. Domingo, DE TUSSAC. — Tripinnate.
A. van Heurckii Fourn. — Mexico. — I. 273.

Dryopteris *amambayensis* Christ, Fedde Repert. **7**: 374. 1909. — Paraguay, HASSLER no. 10411 b. — Probably *Goniopteris*.
D. collina Christ. — Paraguay. — I. 95—96.
D. Hassleri Christ. — Paraguay. — I. 156.
D. Herzogii Ros. — Bolivia. — supra p. 23.
D. Rojasii Christ. — Paraguay. — I. 156.

Goniopteris *ferax* Fée. — Guadeloupe. — I. 213.
G. lucida Fée — Guadeloupe. — I. 272.
G. macrocladia Fée. — Brazil. — I. 268.

Gymnogramme *prolifera* Fée, Gen. 182. 1852. — Brazil? — Seems to belong to *Goniopteris*.
G. pteroides Fée, Gen. 182. 1852. — Brazil, VAUTHIER. — Probably identical with *D.* (*Leptogramma*) *polypodioides*.

Lastrea *Balbisiana* Bory, Dict. class. **9**: 234. 1826. — West Indies?
L. Cumingiana Pr. — Chile. — I. 156.

Meniscium — see I. 272.

Nephrodium *aureo-viridum* Jenm. — Brit. Guiana. — I. 263.
N. basiattenuatum Jenm. — Jamaica. — I. 156.
N. chaerophylloides Desv. Prodr. 261. 1827. — Porto Rico? — Perhaps the same as *D. chaerophylloides* (Poir.) C. Chr.
N. cinereum Sod. Sert. Fl. Ecuad. II. 26. 1908; *Dryopteris cinerea* C. Chr. Ind. Suppl. 31. 1913. — Ecuador. — I. 156.
N. clypeolutatum Desv. — Jamaica. — I. 165.
N. crenulaeum Jenm. — Jamaica. — I. 156.
N. elegantulum Sod. — Ecuador. — I. 156.
N. Etchichuryi Hicken, Trabajos Mus. Farm. Buenos Aires **19**: 5. 1907; *Dryopteris Etchichuryi* C. Chr. Ind. Suppl. 32. 1913. — Northern Argentina and Paraguay. — Presumably one of the numerous forms of *D. rivularioides*.

N. Grayi Jenm. — St. Lucia. — I. 172.
N. inaequale Schrad. — Brazil. — I. 246.
N. Lilloi Hicken, Anal. Soc. cient. Argentina **63**: 8 cum tab. 1907; *Dryopteris Lilloi* C. Chr. Ind. Suppl. 34. 1913. — Tucuman, LILLO nr. 2932. — Probably a distinct species, in habit resembling *D. connexa*, but indusiate; perhaps an ally of *D. nemophila.*
N. longipilosum Sod. Sert. Fl. Ecuad. II. 26. 1908; *Dryopteris longipilosa* C. Chr. Ind. Suppl. 35. 1913. — Ecuador. — I. 156.
N. negligens Jenm. — Jamaica. — I. 131.
N. oppositum Fée. — Martinique. — I. 195.
N. paucijuga Jenm. — Jamaica. — I. 196.
N. poireti Desv. Prodr. 258. 1827; *Polypodium pubescens* Poir. Enc. **5**: 546 (non L.) — Martinique. — *D. patens*?
N. raddi Desv. Prod. 258. 1827. — Brazil. — *D. patens* or *D. oligophylla*?
N. rigescens Sod. — Ecuador — I. 156.
N. subfuscum Bak. — Guiana. — I. 167.

Peltochlaena *nephrodiiformis* Fée. — Guiana. — I. 81.

Phegopteris *amplificata* Fée. — Mexico. — I. 272.
Ph. Blanchetiana Fée. — Brazil. — I. 112.
Ph. ciliata Fée, Gen. 248. 1852. — Cuba, LINDEN no. 270. — I. 272.
Ph. ctenoides Fée, 11. mém. 54 t. 14 f. 2. 1866. — Sto. Domingo, DE TUSSAC. — By JENMAN adopted as a good species, also found in Jamaica, but probably the same as *D. rudis*; see my first paper p. 326.
Ph. fluminensis Fée. — Brazil. — I. 112.
Ph.? inaequalis Fée, 8. mém. 91. 1857. — Mexico, SCHAFFNER no. 240, 240 b, 241 a. — By FOURNIER, Mex. pl. **1**: 98, referred to *D. equestris*, but it is said to be arborescent with a spiny trunk; can it be an *Alsophila*?
Ph. leptoptera Fée. — Sto. Domingo. — I. 156.
Ph. melanorachis Fée. — Mexico. — I. 272.
Ph. organensis Fée, Cr. vasc. Brés. **1**: 105. 1869. — Rio. — GLAZIOU no. 2821. — ?
Ph. perforata Fée — supra p. 30.
Ph. pilosula Fée, 8. mém. 90. 1857. — Mexico, LINDEN no. 126 — t. FOURNIER = *D. oligocarpa.*
Ph. Sturmii Philippi, Anal. Univ. Chil. **94**: 358. 1896; *Dryopteris Sturmii* C. Chr. Ind. 295. — Chile, prov. Valdivia. — Described from sterile specimens. Probably allied to *D. subincisa* and *D. spectabilis.*

Polypodium *abruptum* Desv. Prodr. 239. 1827 — »in Antillis«. — ?
P. ambiguum Desv. Prodr. 242. — Brazil. — According to a fragment in Herb. Berol. this seems to be a form of the group of *D. subincisa*, perhaps *D. connexa.*
P. angustifrons Kze. Linnæa **13**: 134. 1839. — Mexico, SCHIEDE no. 758 a. — According to Mett. Aspid. 65 this falls under my *D. patula* but may be an allied species, if really an *Eudryopteris.*
P. colubrinum Vell. Fl. flum. **11** t. 71. — Brazil. — Said to be *D. abbreviata.*
P. daucifolium Poir. Enc. **5**: 542. 1804. — Porto Rico. — *D. effusa*?
P. foecundum Vell. Fl. flum. **11** t. 75. — Brazil. —?
P. gracilentum Jenm. — Jamaica. — I. 133.
P. hirtum Vell. Fl. flum. **11** t. 79. — *D. dentata* or *D. Bangii*?
P. involutum Desv. Berl. Mag. **5**: 318. 1811 — »in Antillis« — It is very improbable that this is *D. heteroclita*, to which it was referred in Index; can it be *D. cheilanthoides*?
P jamaicense Desv. Berl. Mag. **5**: 318. 1811. — Jamaica. — *Lastrea* or *Cyclosorus*?
P. lanuginosum Vell. Fl. flum. **11** tab. 70. — Brazil. — *D. falciculata*?

P lepigerum **Schrad. — Brazil. — I. 99.**

P. ligustifolium **Poir.** Enc. **5**: 553. 1804. — Buenos Aires, COMMERSON. — In Ind. Fil. referred to *D. denticulata*, but I think it is *Polystichum adiantiforme* sens. lat.

P. lunanianum **Hew. — Jamaica. — I. 278.**

P. odorum **Vell. Fl. flum. 11 t. 78. —** ***D. patens*****?**

P. pennatum **Poir. — I. 263.**

P. pulverulentum Poir. Enc. **5**: 555. 1804 = *Aspidium lutescens* Willd. sp. **5**: 272. 1810. — Both were founded on Plumer t. 34, illustrating a decomposite species from Sto. Domingo. It is probably *D. ampla.*

P. resiniferum Desv. Berl. Mag. **5**: 317. 1811. — »in America calidiori«. — *D. opposita* or *D. Sprengelii*?

P. retroflexum L. sp. **2**: 1089. 1753. — Based on Plumier t. 68. — Sto. Domingo. — *D. asplenioides*? or a related species of *Goniopteris.*

P. serratum **Vell. Fl. flum. 11 t. 77. — Brazil. — Is no doubt** *D. gongylodes*, not at all *D. serra*, to which it was referred in Ind. Fil.

P. sloani **Desv. Prodr. 238. — Jamaica. — Founded on Sloane, Jam. t. 29. =** *D. reptans.*

P. Smithianum Hew. — Jamaica. — I. 228.

P. subulatum **Vell. Fl. flum. 11 t. 67. — Brazil. —** *Lastrea* or *Cyclosorus*?

P. truncatum Poir. Enc. **5**: 534. 1804. — Brazil. — This is generally made the type of the common Asiatic-Polynesian *Dryopteris truncata* (v. Ind. Fil. 299) but no doubt it is totally different; according to the description it seems to belong to § *Goniopteris* and is probably identical with one described in the first part of this monograph. The name *truncata* for the Polynesian species is consequently unavailable and another specific name must be substituted for it.

P. Urbani **Sod. — Ecuador. — I. 268.**

Polystichum *cystopteroides* **Nees. — Mexico. — I. 69.**

Species excluded from the Genus.

Aspidium Braunianum Karst. Fl. Col. **1**: 63 t. 31; *Dryopteris Brauniana* O. Ktze.; C. Chr. Ind. 255. — This characteristic species from the Andes of Colombia cannot naturally be referred to any of the subgenera of *Dryopteris*. In several characters it agrees with *Ctenitis*, but its wide-creeping rhizome and its whole peculiar habit, which is due to the broad lobate wing to the rachis, is very different from all species of that group. The veins are free but in spite of this I am fully convinced that it belongs to *Sagenia*.

Aspidium pedatum Desv. Prodr. 244; *Dryopteris pedata* O. Ktze.; C. Chr. Ind. 283. — This pretty Jamaican species, excellently illustrated in Kunze's Farrnkr. tab. 75, is like *A. Braunianum* a free-veined *Sagenia*. Fée made it a separate genus: *Camptodium* which perhaps ought to be restored.

Dryopteris Morlae (Sod.) C. Chr. Ind. 278; *Polypodium Morlae* Sod. Cr. vasc. quit. 461. 1893 is no *Dryopteris* at all but a large species of *Aspidium* § *Arcypteris*. (RBI).

Dryopteris apiifolia (Sw.) O. Ktze. = *Polystichum apiifolum* C. Chr. Ind. 578 is the type of the genus *Maxonia*, a derivate of *Polystichopsis*.

Dryopteris paraguayensis C. Chr. Ind. 282 — *Phegopteris subsimilis* Christ, Ann. Cons. Jard. bot. Genève **3**: 36. 1899 from Paraguay is probably a species of *Alsophila* (v. supra p. 81).

Dryopteris punctata (Thbg.) C. Chr. Ind. 287. — Under this name I included in Ind. Fil. a number of American forms, the best known of which is the Chilean *Polypodium Poeppigii*. None of these forms belong to *Dryopteris*, but must be referred to *Hypolepis*. They differ from *Dryopteris* in the wide-creeping rhizome that is clothed with rufous, articulated hairs, true scales being always absent. Their generally much divided lamina resembles not a little certain species of *Dryopteris*, groups of *D. ampla* and *D. subincisa*, but the sori are placed near the margin, sometimes covered by an unaltered lobe or tooth of the margins. It is impossible, I think, to separate these forms from the species commonly referred to *Hypolepis* (*H. repens* etc.). I have not sufficient material for a thorough revision of these forms that are greatly misunderstood. According to modern ideas several of the forms are valid species, and a number of such have been described, but the nomenclature is very confused. I mention

Hypolepis rugosula (Labill.) var. *Poeppigii* (Kze.) comb. nov. — *Polypodium Poeppigii* Kze. Linn. **9**: 50. — Chile. Juan Fernandez. — I cannot separate this from the Australian *H. rugosula* (Lab.) as a species. From this Mettenius distinguished a Chilean plant under the name *Hyp. Poeppigiana* (Fil. Lechl. I. 18), which he considered a true *Hypolepis* while *Pol. Poeppigii* Kze. to him was a *Phegopteris*. I am convinced that these Chilean forms are referable to a single species.

Hypolepis obtusata (Pr.) Kuhn, Chætopt. 347; *Cheilanthes obtusata* Pr. Rel. Hænk. **1**: 64 t. 11 f. 1. 1825. Peru. — The figure shows a small, bipinnatifid leaf, but otherwise it agrees closely with *Polypodium fulvescens* Hook. et Grev. in Hook. Bot. Misc. **2**: 239. 1831, also from Peru (Cruckshanks, Mathews no. 968, Kew!), which full-grown is fully bipinnate.

In Brazil a series of forms occur which Baker in Fl. Bras. referred to *Polypodium punctatum* var. *rigescens* (Kze.) Fl. Bras. 1^2: 503 t. 65. These forms should probably be referred to at least two species: *Hypolepis brasiliana* (Pr.) Kuhn and *H. mitis* Kze.

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equestris (Kze.) C. Chr.	315	54
erythrostemma (Christ) C. Chr.	334	76
Etchichuryi (Hicken) C. Chr.		124
excelsa (Desv.) C. Chr.	314	54
exculta (Mett.) C. Chr.	351	95
firmifolia (Bak.) O. K.	357	109
flexuosa (Fée) O. K.	298	33
formosa (Fée) Maxon	363	119
— Maxon olim	360	115
Fuertesii Brause	175	25
**fuliginosa* C. Chr.	364	120
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Galeottii (Fée) C. Chr.	324	65
Gilberti Clute	324	65
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grandis (Pr.) C. Chr.	335	78
**Grisebachii* (Bak.) O. K.	311	44
guadalupensis (Wikstr.) C. Chr.	176	25
guatemalensis (Bak.) O. K.	351	96
Herzogii Ros.	116	23
hirsuto-setosa Hieron.	327	70
hirta (Sw.) O. K.	305	37
hirtula (Kze.) C. Chr.	343	86
hydrophila (Fée) C. Chr.	33	21
inaequalifolia (Colla) C. Chr.	331	73
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Jimenezii Maxon et C. Chr.	30	20
Karsteniana (Kl.) Hieron.	334	76
Karwinskyana (Mett.) O. K.	262	28
laeta (Sw.) C. Chr.	360b	117
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latealata C. Chr.	336	80
leucochaete Slosson	355	107
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leucothrix C. Chr.	14	18
Lilloi (Hicken) C. Chr.		125
lomatopelta (Kze.) C. Chr.	308	41
longipilosa (Sod.) C. Chr.		125
lunensis (Christ) C. Chr.	329	71
lurida (Jenm.) Und. et Maxon	355	107
macrophylla (Kze.) C. Chr.	240	27
macrosora (Fée) C. Chr.	339	82
macrostegia (Hook.) O. K.	358	110
**macrotheca* (Fée) C. Chr.	321	64
Martiana Ros.	340	83

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Mazei (Bak.) C. Chr.	321	64
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melanosticta (Kze.) O. K.	309	42
membranacea (Mett.) C. Chr.	237	27
**meridionalis* (Poir.) C. Chr.	312	46
mexicana (Pr.) C. Chr.	257	27
mollicoma C. Chr.	333	75
mollis (Jacq.) Hieron.	164	24
Morlae (Sod.) C. Chr.		127
myriolepis (Bak.) C. Chr.	308	40
**nemophila* (Kze.) C. Chr.	317	57
nemoralis (Sod.) C. Chr.	213	25
**nemorosa* (Willd.) Urb.	308	40
nephrodioides (Kl.) Hieron.	213	25
normalis C. Chr.	156	23
**ochropteroides* (Bak.) C. Chr.	356	108
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oophylla C. Chr.	307	39
pachyrachis (Kze.) O. K.	62	22
palatangana (Hook.) C. Chr.	316	56
paleacea (Sw.) C. Chr.	248	27
panamensis (Pr.) C. Chr.	16	18
pansamalensis C. Chr.	330	72
paraguayensis C. Chr.		127
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patula (Sw.) Und.	261	28
— var. Moreliæ Christ	257	27
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Poiteana (Bory) Urb.	230	26
popayanensis (Hieron.) C. Chr.	356	108
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pteroidea (Kl.) C. Chr.	125	23
**pubescens* (L.) O. K.	353	103
punctata (Thbg.) C. Chr.		127
Raddii Ros.	38	21
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**rigidissima* (Hook.) C. Chr.	361	118
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Rosei Maxon	15	18
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**Shaferi* Maxon et C. Chr.	19	18
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**spectabilis* (Klf.) C. Chr.	326	69
**squamosissima* (Sod.) Chr.	332	74
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— *Berteroana C. Chr.	331	73
— var. bogotensis Hieron.	332	75
— *canescens C. Chr.	338	82
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— *vasta C. Chr.	325	68
— *vestita C. Chr.	326	70
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Trianæ (Mett.) O. K.	357	109
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ulvensis Hieron.	352	97,99
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acutum Lindm.	352	100
— Hook.	350	94
	357	109
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amplum Hook.	311	44
— Bak.	313	49
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Galeottii Fée	324	65
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Naturvidenskabelig og mathematisk Afdeling,

8de Række.

		Kr.	Øre
	I, 1915—1917	10.	75.
1.	**Prytz, K.** og **J. N. Nielsen:** Undersøgelser til Fremstilling af Normaler i Metersystemet, grundet paa Sammenligning med de danske Rigsprototyper for Kilogrammet og Meteren. 1915	1.	55.
2.	**Rasmussen, Hans Baggesgaard:** Om Bestemmelse af Nikotin i Tobak og Tobaksextrakter. En kritisk Undersøgelse. 1916	1.	75.
3.	**Christiansen, M.:** Bakterier af Tyfus-Coligruppen, forekommende i Tarmen hos sunde Spædkalve og ved disses Tarminfektioner. Sammenlignende Undersøgelser. 1916	2.	25.
4.	**Juel, C.:** Die elementare Ringfläche vierter Ordnung. 1916	»	60.
5.	**Zeuthen, H. G.:** Hvorledes Mathematiken i Tiden fra Platon til Euklid blev en rationel Videnskab. Avec un résumé en français. 1917	8.	»
	II, med 4 Tavler, 1916—1918	11.	50.
1.	**Jørgensen, S. M.:** Det kemiske Syrebegrebs Udviklingshistorie indtil 1830. Efterladt Manuskript, udgivet af *Ove Jørgensen* og *S. P. L. Sørensen.* 1916	3.	45.
2.	**Hansen-Ostenfeld, Carl:** De danske Farvandes Plankton i Aarene 1898—1901. Phytoplankton og Protozoer. 2 Protozoer; Organismer med usikker Stilling; Parasiter i Phytoplanktonter. Med 4 Figurgrupper og 7 Tabeller i Teksten. Avec un résumé en français. 1916	2.	75.
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	III, med 14 Kort og 12 Tavler, 1917—1919	26.	00.
1.	**Wesenberg-Lund, C.:** Furesøstudier. En bathymetrisk Undersøgelse af Mølleaaens Søer. Under Medvirkning af Oberst *M. J. Sand*, Mag. *J. Boye Petersen*, Fru *A. Seidelin Raunkiær* og Mag. sc. *C. M. Steenberg*. Med 7 bathymetriske Kort, 7 Vegetationskort, 8 Tavler og ca. 50 i Texten trykte Figurer. Avec un résumé en français. 1917	22.	»
2.	**Lehmann, Alfr.:** Stofskifte ved sjælelig Virksomhed. With a Résumé in English. 1918	3.	15.
3.	**Kramers, H. A.:** Intensities of Spectral Lines. On the application of the Quantum Theory to the problem of the relative intensities of the components of the fine structure and of the stark effect of the lines of the hydrogen spectrum. With 4 plates. 1919	9.	50.
	IV (under Pressen).		
1.	**Bohr, N.:** On the Quantum Theory of Line-Spectra (under Pressen).		
	V (under Pressen).		
1.	**Bjerrum, Niels** und **Kirschner, Aage:** Die Rhodanide des Goldes und das freie Rhodan. Mit einem Anhang über das Goldchlorid. 1918	3.	50.
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